THE JOURNAL OF GAS LIGHTING
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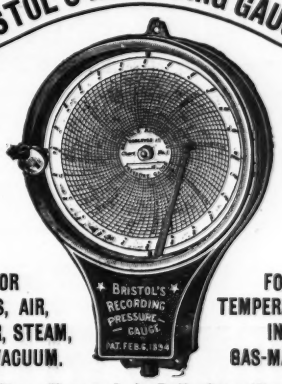

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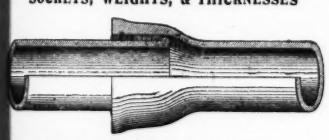

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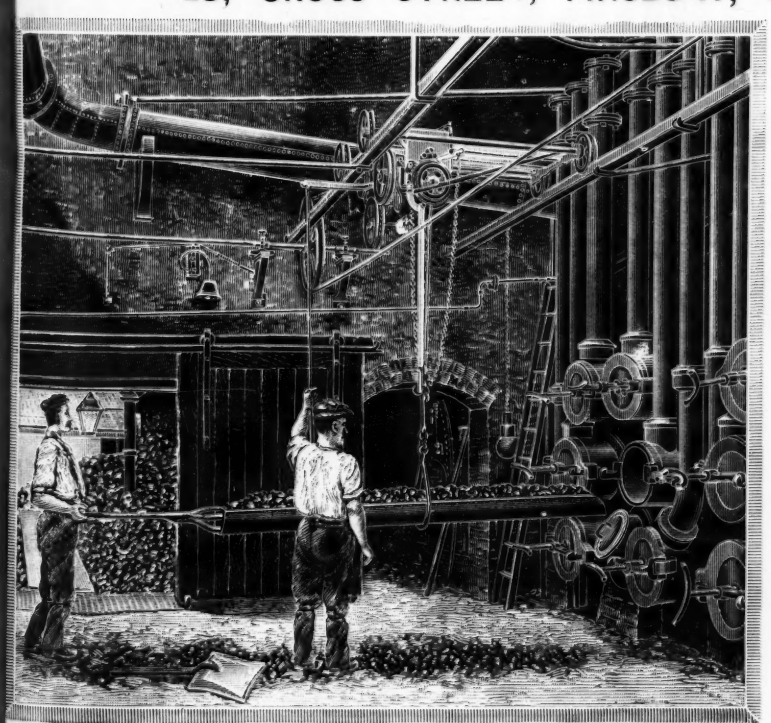

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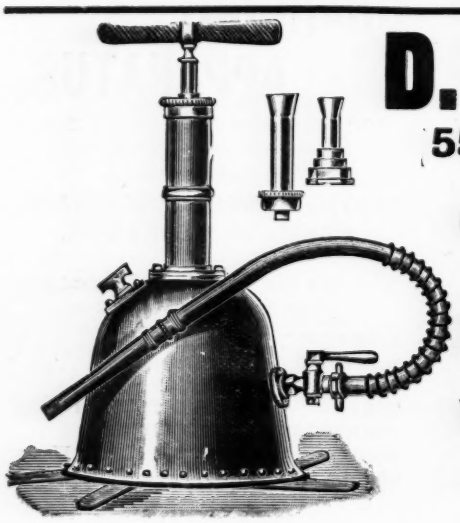

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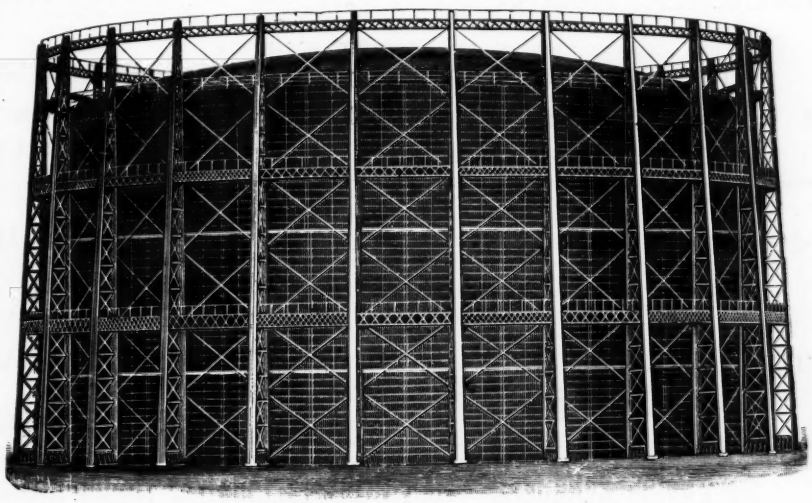

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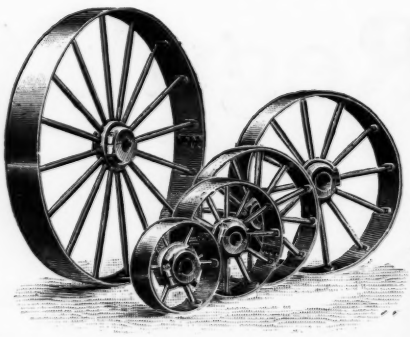

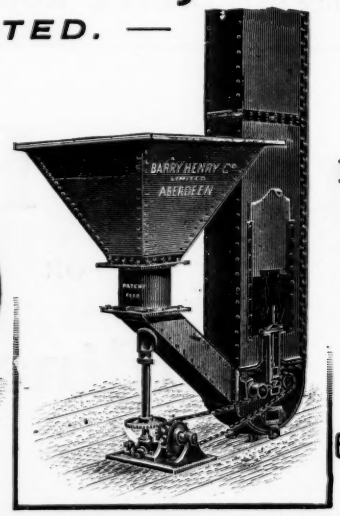

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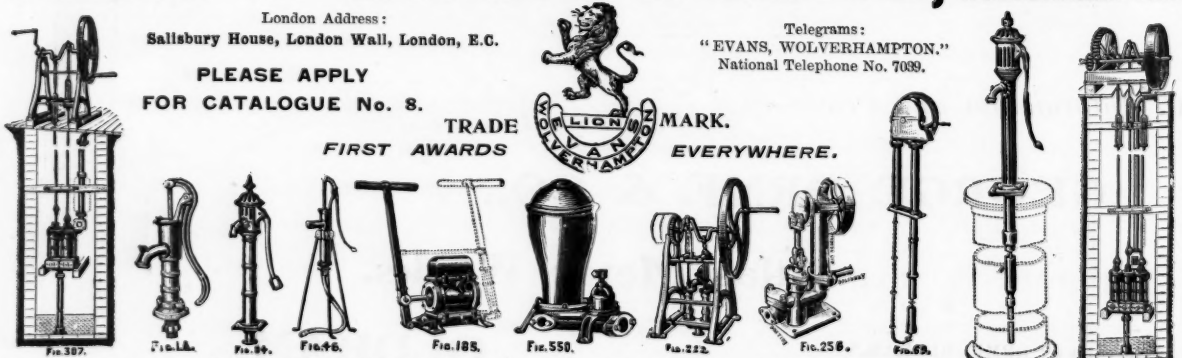

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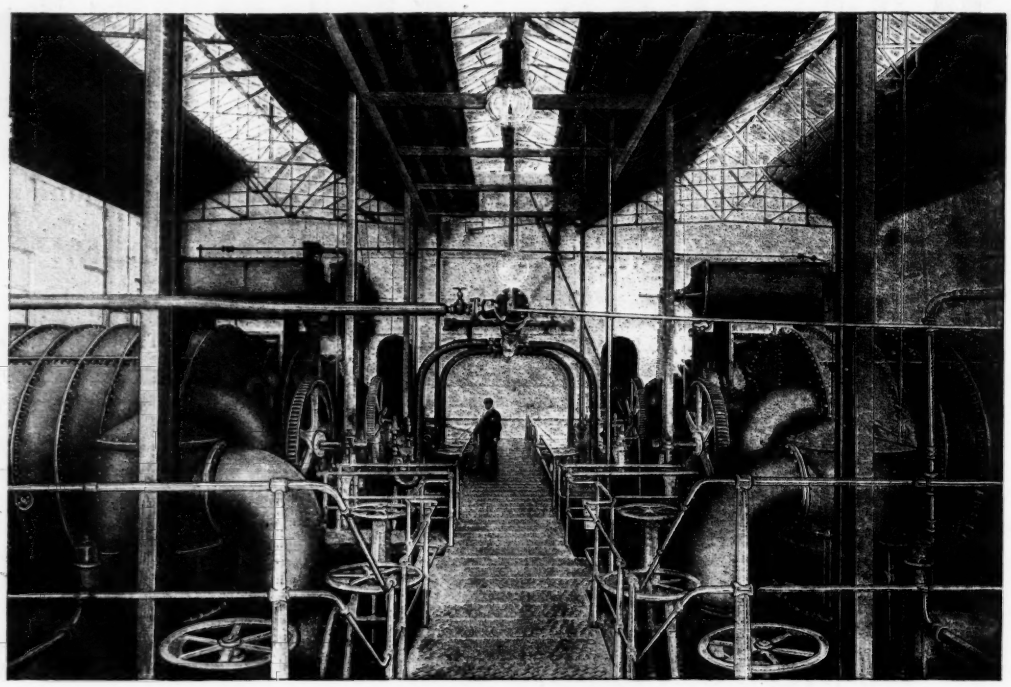

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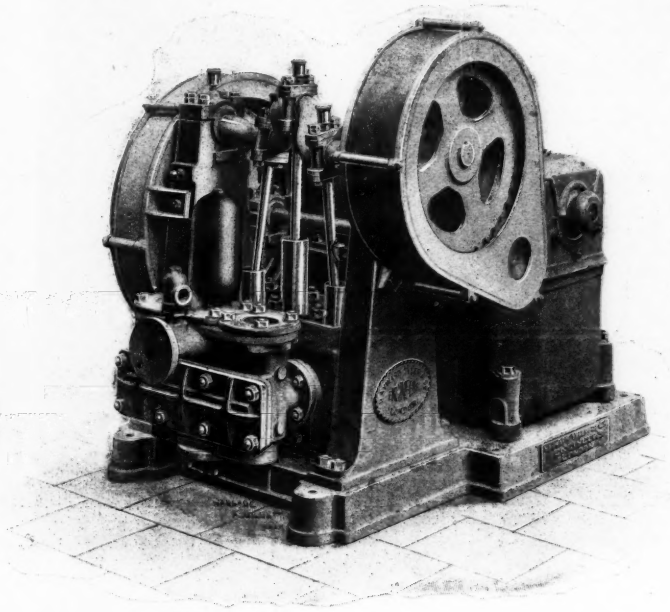

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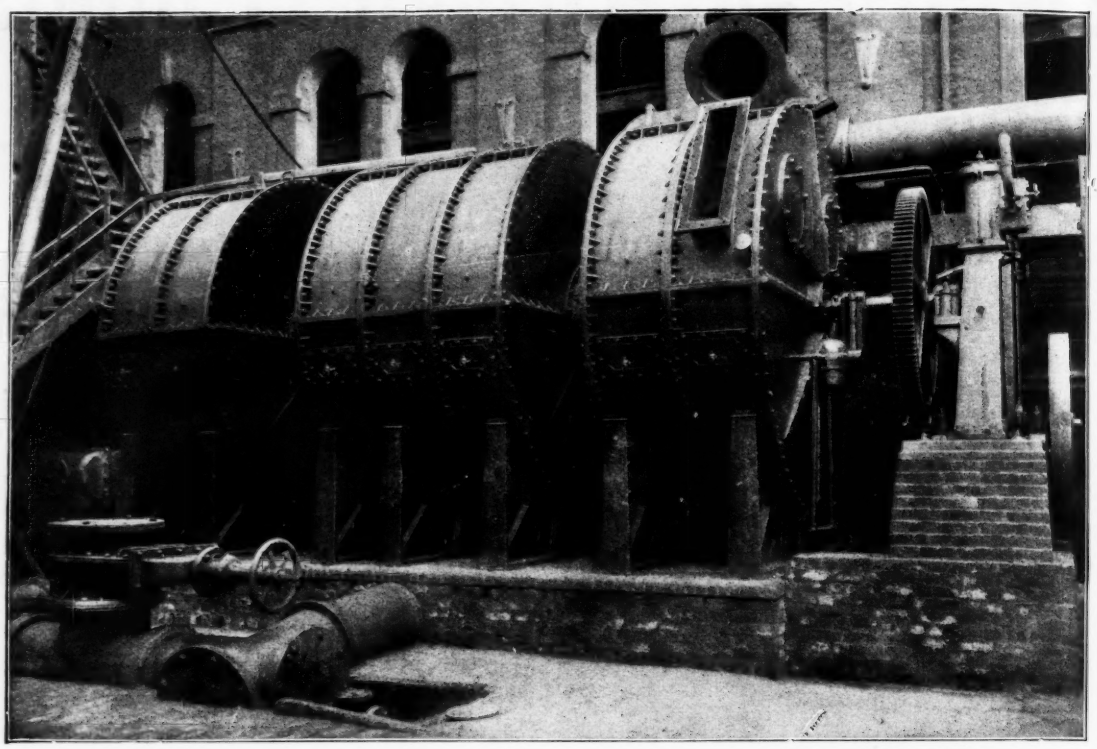

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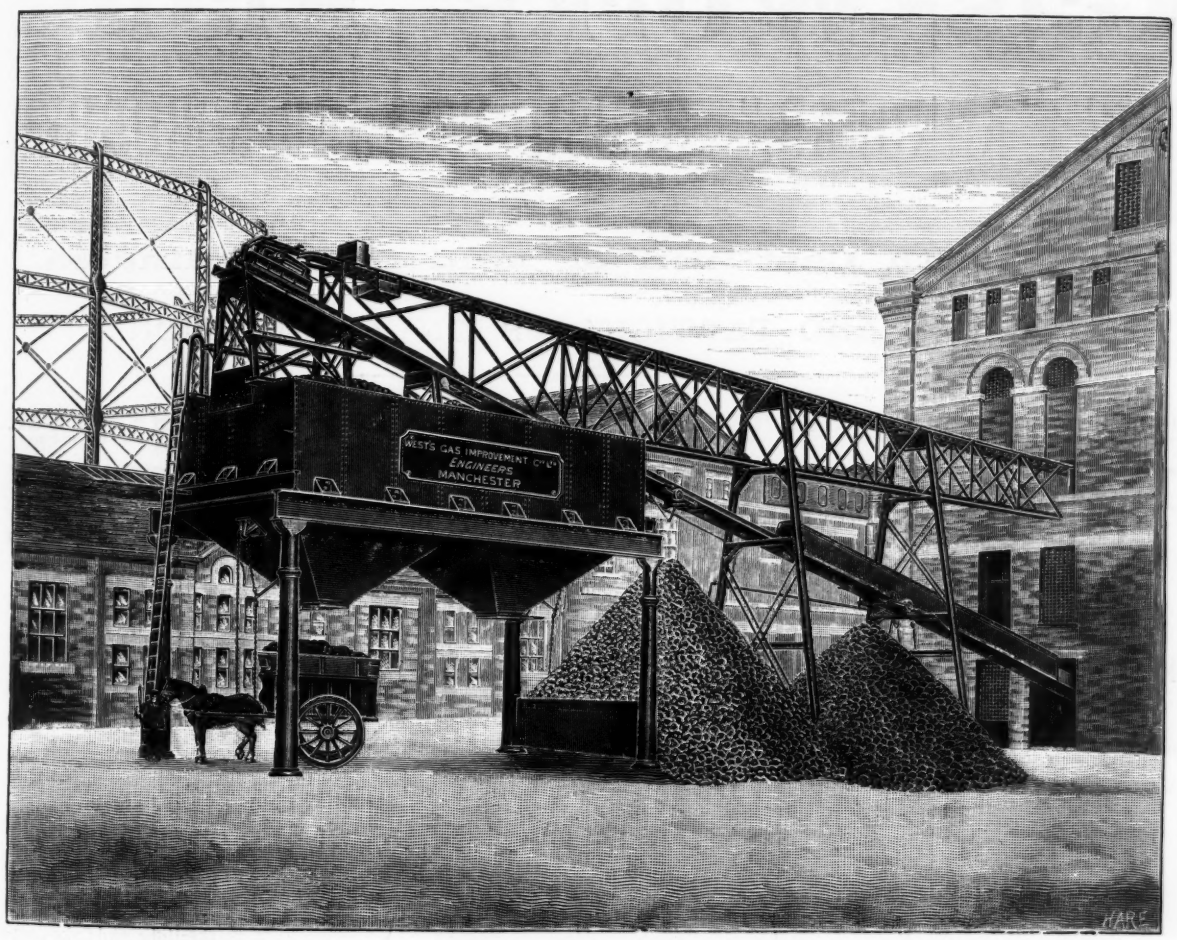

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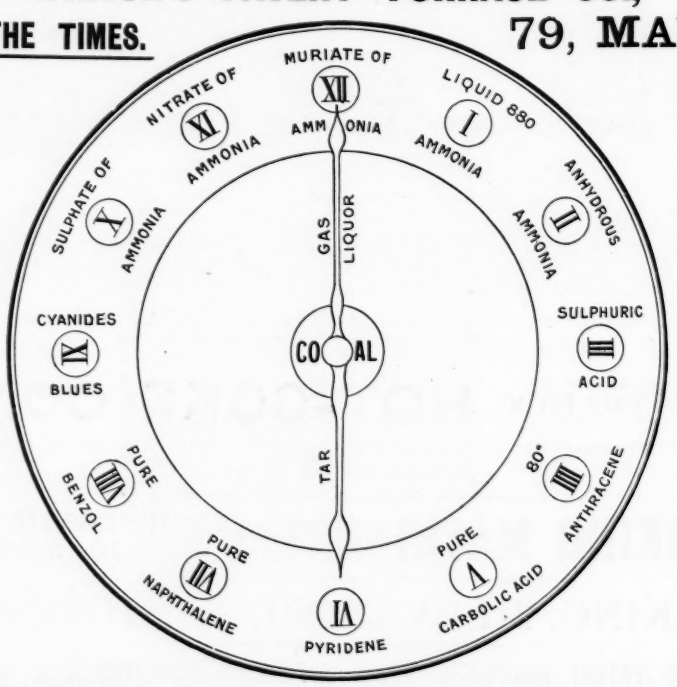

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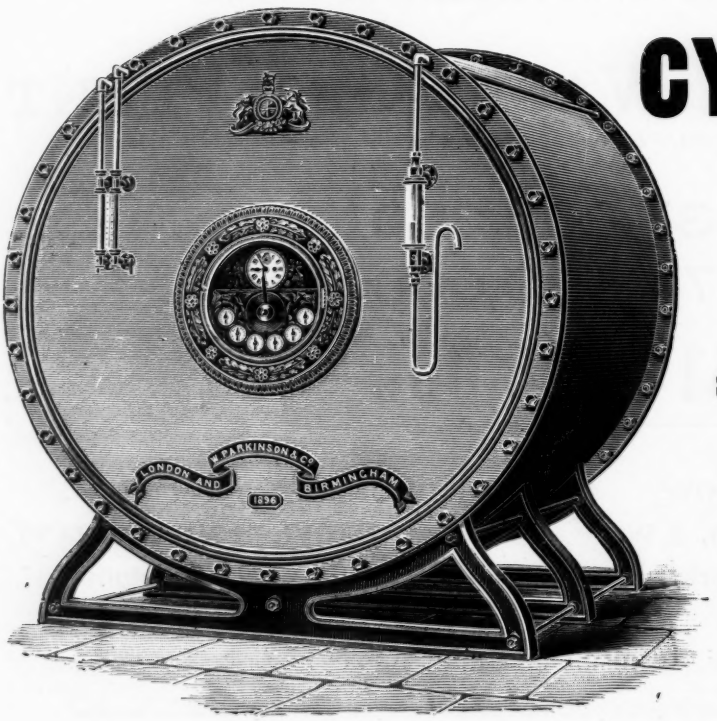

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EDITORIAL NOTES.

Life Among the Junior Gas Engineers—Professor Smithells and the Gas Industry.

IT cannot be otherwise than a matter of extreme gratification to us, in view of the articles which appeared some time since in these columns on "The Sons of the Gas Industry," and which won a certain amount of commendation and (we are not at all annoyed by the knowledge) an insignificant amount of covert contempt, that a single number of the "JOURNAL" should contain, as the issue of to-day does, so much evidence of spirited movement among the junior members of the gas profession. The Yorkshire Junior Gas Association was started on Saturday with such *éclat* that it is already well on the road to match in numbers and enthusiasm its older and well-established neighbour the Manchester District Junior Institution, the members of which were also meeting on Saturday. The previous night the London Association opened the work of their second session. Reports of these various meetings appear in our "Technical "Record" columns; and, in addition, an article is published narrating the remarkable success that has been achieved by the Junior Institution of Engineers, and which success should embolden the Associations in which we are just now more immediately concerned.

No credit is due to the little agitation of eighteen months or so ago in these columns for the inception of the Manchester Junior Institution; but we are glad to think that it had some influence in bringing into being the two newer organizations. These striking efforts at self-help on the part of the younger members of the profession serve as an ample justification for the plea made, on their behalf, to the senior organizations for greater recognition and encouragement, together with provision of opportunities for enlarging their experience and ideas. The very existence to-day of these Associations is proof positive that the aspirations of those with their feet on the lower rungs of the ladder are in the direction indicated; and we are not without hope that consideration will be given by the Institution of Gas Engineers to the question of how best they can aid in cultivating the objects which the junior organizations have in view, and help those who are situated in districts which are not so thickly studded with gas-works as are those of London, Lancashire, and Yorkshire. It has been suggested that ample provision is made by the class of associates in the senior organizations. We venture to differ from those who may be of that opinion. The junior members are lost at meetings where their seniors are in force sufficient to sustain the proceedings; and, moreover, it is inconvenient for assistants to be attending meetings at times when their chiefs are similarly engaged. However, in connection with the new organizations, until direct countenance and support are given by the premier Institution or the District Associations, we feel sure that individual gas engineers will do their utmost in helping to promote these practical endeavours of their assistants. There are many ways in which this can be done; and several engineers have recognized some of them. Let it be remembered that the juniors represent the rear-line of the profession; and it is from this line that the gaps that Time makes in the front rank have to be filled. The responsibilities of the profession, as has often been said, do not become less; therefore the opportunities for qualifying for those responsibilities should become the greater.

As already mentioned, the inaugural meeting of the Yorkshire Junior Gas Association on Saturday was a brilliant success; and Professor Smithells, of the Yorkshire College, took a no small part in making it so. An old student under Bunsen, his flame researches have taken a prominent place in his studies. His name and his work are well known to the gas industry; but we should much like to see a more intimate association between him and the gas profession, whose indebtedness for his labours has been but scantily recognized. The lecture which he delivered on Saturday to the Yorkshire Junior Association, having for its theme the Bunsen burner and luminous and non-luminous flames, was one which shed a good deal of light and guidance upon and for those whose privilege it was to hear it; and the sketch of his clear exposition which appears elsewhere will have a similar effect on many who are more advanced in years than those who heard the deliverance itself. Unlike most after-dinner speeches, too, that which Professor Smithells made on this occasion is such that to have curtailed it would have spoilt it; and therefore it is published almost *in extenso*. It had for its subject applied science and gas-lighting, and contained many truths. One part may perhaps be found by many (however conscious they may be as to its truth) somewhat unpalatable. Professor Smithells urges the greater unity of science with gas making—finding that the British gas industry is lamentably wanting in men who are scientific masters of their craft. "Brilliant men," he says, "there are in it, I know full well; and far be it from "me to under-estimate the qualities which, as I have said, "must always supplement scientific learning, if scientific "learning is to be made available. But the science which "is involved in gas making and gas using in its highest "development is high science, deep science, and not science "that can be picked up casually by the wayside. I believe "there are extremely few men in the British gas industry "who are equipped with such science." Professor Smithells is confident that this state of things is remediable; and he has in his mind more than one measure that might be taken. The formation of such Associations as the one he was then addressing is "an unmistakeable step in this direction." As to what the other measures are, he does not enlighten us; but we hope he will take an early opportunity of doing so, in order that the gas industry may discuss at the same time both the views set forth above and the remedies. Professor Smithells' attachment to the gas industry, and his distinguished position, entitle his observations to the greatest respect; and any criticisms and advice emanating from him must and will receive very careful consideration. The Yorkshire Junior Association are to be congratulated on having obtained his friendship.

The Annual Meeting of the Gas Companies' Protection Association.

THE annual general meeting of the Gas Companies' Protection Association was held on Friday, and the proceedings will be found duly reported in another column. The report of the Committee is of an interesting character, and fully bears out the ideas formed respecting the function of an organization of the kind. It is only necessary to bear in mind the scale upon which the manufacture and supply of illuminating gas is carried on by British Gas Companies, to perceive that an industry of this great magnitude, touching the life and laws of the community at so many points, needs watching over in the manner provided for by this Association. The meeting was rendered memorable by the circumstance of the retirement of Sir George Livesey from the chairmanship of the Committee of the Association, on the ground of feeling that the time has arrived when he must decrease his labours. This is the first indication that has yet appeared in respect of any of Sir George Livesey's regular public engagements, that he desires to reduce his activities in the service of the industry of which he is the acknowledged head. He will be greatly missed in connection with the Association, the history of which will be found recorded in his official speeches. In creating a new office of distinction—that of Vice-President of the Association—and asking Sir George to fill it, the members have done their utmost to testify to the reality of their regard for him, and of their desire to retain his sympathy.

The formal business of the re-election of retiring members of the Committee evoked a perfectly natural remark and small discussion on the subject of the re-election of such members as a matter of course. It is always difficult to avoid the falling of these matters of administration into a

rut; and this is to be regretted where it is desired to spread and keep alive the interest of the general body of members. The present Committee of the Association is unexceptionally representative; but if the members would like a little better circulation, they can easily ensure it. The benefits of the Association are to be extended to Gas Companies with a capital of £10,000 and under, at a reduced subscription. As Alderman Hart observed, the Association has been almost stagnant for some time, which is not altogether as it should be. We have pleasure in recording the choice of Mr. H. E. Jones as the new Chairman of the Committee of the Association, in succession to Sir George Livesey. As Mr. Jones remarked, he is entitled to be regarded as representing more than the Commercial Gas Company, with which his name is chiefly identified. It would be hard to assign a limit to the new Chairman's credentials in this regard.

Corporation Gas Committees and Gas-Stoves.

THE policy of certain Municipal Corporations in regard to the letting out of gas-stoves seems to call for some notice. In Manchester, according to an official statement to which we gave publicity last week, the Chairman of the Gas Committee (Alderman Gibson) is perfectly satisfied with the results so far obtained of the experiment of supplying gas-stoves free of charge. At Leicester, as will be seen by the report of the proceedings of the Town Council meeting in another column, a proposal to copy the Manchester example, sprung upon the Corporation, was defeated by a considerable majority. We are strongly of opinion that this was the proper course to take in the circumstances, and congratulate Leicester once more on the wisdom of its Corporation. As the Mayor (Alderman Vincent) very justly observed, this kind of proposal really means a constantly increasing demand for doles, to be given to some of the inhabitants of the town at the expense of others. It has been pointed out many times, that the modern English municipal fashion of providing all sorts of things "gratis," amounts to a grave economic evil, and may easily become a public danger. One such dole leads to, and is made an argument in support of, another. The free library movement was perhaps at the bottom of this craze; and, indeed, if the rates of a town are properly chargeable with the expense of maintaining eleemosynary libraries and reading-rooms, it is next to impossible to draw the line at anything.

One feels, however, that if the discrimination of a principle in this regard is difficult, there are grounds of expediency and common sense on which it is possible to judge any fresh municipal dole that may be proposed. We have not the slightest hesitation, on the merits of the suggestion, in declaring that the furnishing of gas-stoves free of charge to ordinary consumers by meter is undesirable. Unhappily, it is impossible at the present day to put the objection on a higher plane. This is one of the consequences of municipal trading in electricity for illuminating and power purposes. While the supply of municipal electricity is done partly out of the rates, as it is in most places, and while all manner of desperate steps are now being taken in order to impart an air of success to this kind of enterprise—by free wiring and unscrupulous advertisement—it would be a hard saying that the gas consumer must be treated with Spartan severity. That is, obviously, Manchester's excuse. There the sale of gas had begun to exhibit a check; and the Gas Committee were hard beset to do something by way of a remedy. It is necessary to make this admission, in order to show that, in allowing Leicester to have acted rightly in the circumstances, we do not necessarily reflect upon Manchester. Both Corporations are not exactly right in taking directly opposite courses; but there are explanatory circumstances in both cases for which due allowance should be made. This is, in short, a remarkable illustration of the well-worn aphorism that "circumstances alter cases." If Leicester is in the right, Manchester is not inevitably in the wrong.

To the view of the Leicester conditions as expounded by Mr. Edwards, the Chairman of the Gas Committee, and the Mayor, no exception can possibly be taken; and their treatment of the proposal before the Council was conspicuously—even brilliantly—correct and convincing. It was instinct with statesmanship of a high order. The proposition, to begin with, ought to have been first mooted in Committee, where it could have been properly dealt with. Mr. Edwards, however, was fully equal to the emergency. A glance at the statistics he had at his fingers' ends inspires some reflections. There cannot be many gas-supply districts capable of indicating such a high degree of saturation with gas; and it would be interesting to know the consumption per house and per head of the population. The Mayor, for his part, struck a good note when he urged the Council to hesitate before adopting a policy which would increase the rates for all time. That is wise advice. It is very nice and popular to abolish meter-rents, for example, as is done in so many places; but it is still an open question whether the undertaking ever gets value for the concession, which is irrevocable. The capitalization of these boons and blessings should be fairly regarded before they are given away, for this reason: Almost the only adjustable figure in relation to gas supply is the price of gas itself; and it is prudence to hold that whatever can be given away in consequence of favourable working, should preferably be in this form. The consumer feels it, and he does not forget the price of his gas; whereas he very soon takes the absence of meter-rent, or even of stove-rent, for granted. Without making too much of the "trade" grievance, moreover, there can be few localities in which the gratis supply of gas-stoves would not strike the outside trade as unfair rate-aided competition. Everybody knows what is done in Manchester when the gas profits do not realize enough to pay the usual subsidy in aid of the rates. They raise the price of gas until the desired result is achieved. The cost of abolishing stove-rents must be borne in the same way. We would rather have seen the rents retained, even if a discount on their gas bills had been allowed to all consumers using gas-stoves. This "free gift" way of doing business grates on one's sense of trade proprieties.

The Free Labour Congress—Some Reflections on Workmen's Characters.

THE Annual Congress of the National Free Labour Association was held last week in London, under the presidency of Mr. John Chandler. The proceedings comprised the delivery of a presidential address, the reception of the annual report on the working of the Association, and the usual discussion and passing of resolutions antagonistic to Trade Unionism. It cannot be too widely known among employers, and workmen who have not yet exchanged their birthright of liberty for Trade Union bondage, that this Association exists primarily to combat strikes. It is therefore far from being, like the Trade Union Congress, a mere collection of persons having the "gift of the gab" for the purpose of talking at large. On the contrary, the managers claim to be in possession of perfect machinery for supplying willing labour of every description on emergencies, and by this means to have satisfactorily dealt with 500 strikes during the eleven years' existence of the Association. It is stated in the report—and the fact has already been mentioned in the "JOURNAL"—that the General Secretary, Mr. W. Collison, has been approached with a view to the organization of a Free Labour Association on similar lines in the United States. If the statement relating to the labour conditions of Chicago published in these columns last week is true, it must be concluded that some such measure is imperatively called for in that part of the world, if the social edifice is not to crumble into ruin. There would be bloodshed, of course, in any event.

It is very curious to mark how consistently the Association takes the opposite side to Trade Unionism in regard to every public question or controversy of the hour. Municipal trading, for example, is a strong point with the Trade Union leaders and Socialists. Whatever may be the nature of the reasons which overrule the better class of municipal statesmen in this regard, it is scarcely disguised that to the working-class voter municipal trading means "soft jobs" for this order of the community. To the politician it also means a solid mass of votes capable of being manipulated in a particular way. Therefore the Association will have none of it. The President, in the course of his Inaugural Address, displayed a praiseworthy courage in handling the thorniest of the questions which divide the forces of labour into opposing camps. One of these, as we have repeatedly admitted, is the painful problem of whether too high wages do not do the majority of workmen, as at present constituted, much more harm than good. The immediate need of British industry is some means of convincing working men and lads of the benefit derivable by themselves from steadiness, sobriety, punctuality, and thrift. It is no small compliment to the gas industry that, in looking round over

the whole field of labour, and through the experiences of a long life, Mr. Chandler sees the most hopeful break of the clouds in the profit-sharing and copartnership systems of the South Metropolitan, the Crystal Palace, the Commercial, and a few other Gas Companies. It must never be forgotten, however, by those who would successfully copy and extend these systems, that they bring out into higher relief, rather than obliterate, those fundamental characters of qualification which find their most trenchant description in the old Parable of the Sower. All civilization turns upon the profundities of this great saying. Worldly wisdom also says: "You cannot make a silk purse out of a sow's ear." The meaning is essentially one and the same. Whosoever thinks of sowing a seed of thrift or of inaugurating a higher culture, must first bethink him of the nature of the soil or of the raw material which he has to work upon.

Every employer of labour who has had it in his mind to help his workpeople to improve their condition has learnt, sooner or later, that there are some whom it is impossible to elevate. Mr. Chandler spoke in his address after Mr. Ward (of Denny's, the shipbuilders), who declared publicly in Glasgow last February that the incurable unsteadiness of the riveters, men and boys, is the chief element in determining the output of British shipyards. Money will not procure the doing of work. Many of the men habitually so waste their time, means, health, and opportunities as to make of their high wages the reverse of a blessing. "Certain was "he that wages which in an average lifetime could have "left many workmen in comparative comfort in their middle "and old age, had been of no benefit to them or their "families, but, instead, had given the latter sad and hurtful "experiences, such as they should never have seen or "known." Could there be a sadder testimony to the worthlessness of the material? Profit-sharing could do nothing for such as these. One is left to the mournful reflection that, after all, the proper preparation and selection of the ground is the first obligation upon him who would build a permanent structure—which is as much as to say that in some places it is idle to think of building at all.

Local Government in London.

THE elections for the Metropolitan Borough Councils were held yesterday, and accordingly the system of local government devised with so much care, and fitted to the supposed special requirements of London with such great pains, has been given another trial. It would be very foolish to pretend that so far the experiment has achieved a generally admitted success. The apathy of Londoners in regard to their municipal affairs has not been conquered by the alteration of the old Vestries into Borough Councils; and the chief result of the change observable by the ordinary ratepayer is higher rates. This effect is mainly due to the influence of the only party which is at all eager to obtain power, and calls itself Progressive, which is usually only another name for Trade Unionist and Socialist. Though this party is really small in numbers, it is well organized, and commands some of the largest and poorest of the several Metropolitan Boroughs. Owing to the equalization of rates in the Metropolitan area, some of the expenses of these localities are thrown upon the more thrifty local government districts—an arrangement which is therefore not equally popular all over London.

During their short existence, some Metropolitan Boroughs have contrived to signalize themselves by imperilling the repute of Municipalism, and especially by bringing municipal trading into ridicule and contempt. The most salient example of this mismanagement is furnished by the borough of Marylebone, the Council of which cleverly, and also at enormous cost, provided themselves with a white elephant in the form of a bargain with the local Electric Lighting Company for the acquisition of the parochial portion of their undertaking. In this way the Council have committed themselves to a transaction involving the burdening of the ratepayers with a debt of about a couple of millions, for the object of increasing the price of electric lighting in the district. Needless to say, this has been done in the most regular manner, which leaves no loophole for anybody to call into question the validity of the proceedings. It is hardly necessary to remark, also, that this highly regular proceeding is a piece of midsummer madness, from start to finish. However the business ends, it must be a blow to the reputation of London self-government from which it will take long to recover. Another triumph of London Municipalism, for which the other orders of local authorities throughout the country are not grateful, is the Bermondsey clause of Electric Lighting Orders. It is pretty safe to opine that only a raw and glaringly inefficient local authority would ever have been saddled with such a restrictive regulation.

The experiences, again, of many of these Municipalities in relation to the Government audit have "shown the red "light" to every local authority throughout the land. The sharp practice exhibited by the Borough Council of Shoreditch, in cooking the rate and not providing enough money to pay working expenses, is still an outstanding question. Poplar, also, is in serious straits as regards electric lighting. The Committee here want an open capital account, while the Council insist that the existing establishment shall make both ends meet before any further extensions are effected. There is scarcely one of the Metropolitan Boroughs, in fact, but has some weakness or trouble of its own bringing about, due mostly to the wilful extravagance or the incapacity of its ruling authority; and meanwhile the average Londoner cares for none of these things, and could not help to mend matters much if he did. It would be far better if more of the affairs of London than the control of the police were put in Commission. Local self-government in such a "province of houses" is apt to be a fraud where it is not actually a farce.

A Fresh Move in Municipal Finance.

THE refusal of underwriting for municipal loans has put the Corporations upon their mettle. According to recent observation, certain local authorities are endeavouring to bye-pass the ordinary Money Market altogether, by appealing directly to the public, by means of small advertisements, for loans of moderate amounts. It is rather surprising, and yet it is another illustration of the force of use and wont, that this expedient has not been tried more frequently before. The action of the Corporations who are endeavouring to raise in this simple manner the money they require is a justification of Sir George Livesey's revolt of some years ago against the tyranny of the Stock Exchange. It will be remembered that the South Metropolitan Directors were exposed to the annoyance of finding that whenever they advertised a fresh stock issue, the market was always depressed to the detriment of their undertaking. The experience was not an exceptional one—quite the contrary; the Stock Exchange having made a practice of so abusing the statutory obligation to advertise such issues of capital under the auction clauses, as to make it positively injurious to the undertakings affected. Sir George Livesey, however, was not the man to take a conspiracy of this kind "lying down," and so he took measures to circumvent the conspirators. His example was quickly copied by the London County Council, who likewise tried the expedient of appealing directly to the small investor. This is not always easy to do, as was discovered in the case of the Transvaal loan, when the big fish of the financial ocean took a number of small bites at their intended prey.

It appears, however, that the latest experiments of the municipalities are less likely to go so hopelessly astray. Glasgow is asking for loans on mortgage at 3¼ per cent., and for temporary accommodation offers 3 per cent. Bolton, Leicester, Middlesbrough, and Sunderland are in the same case. All these boroughs, in common with many others, need money, and find the times unpropitious for the issue of big loans. Therefore they are trying what can be done across the counter, so to speak, with small investors. It would be interesting to know how they have fared. There must be any amount of money in the country, which is not under the control of the large financial houses. We believe that several large Corporations already finance themselves by the aid of their own people, very much in this manner; and it appears to be a good idea. Why a person in this country should not be able to lend money to a Municipality, or take up a small amount of Gas Company's stock at the office, just as easily as a foreigner can buy a municipal lottery ticket, seems a mystery needing explanation. It may not be good policy to allow Corporations to issue bonds to bearer, but unless it is in the interest of the banks, including the Post Office Savings Bank, it might be thought that the paths of municipal and statutory company finance could be rendered a little easier to the thrifty public than is actually the case.

The Junior Gas Associations.

The first of our "Editorial Notes" to-day comments on the meetings of the various Junior Gas Associations held last week. The fact that the proceedings at no less than three of these gatherings fall to be chronicled in to-day's "JOURNAL," as well as what appears in the reports of the meetings themselves, augurs well for the vitality of the movement; but, having attained so much success, it will not do for those who are connected with these Societies to sit down quietly, and think that everything requisite has been done. The necessary effort having been made to start the organizations successfully on their career, it must rest with the general body of members to keep them in a state of perfect vigour and the greatest possible usefulness. Careful attention should be given to the remarks made on this subject by Mr. Walter Grafton, in the course of his address at the opening meeting for this session of the London and Southern District Junior Gas Association—not because there is at present any special need for them, but in order that this need may not in the future arise. Mr. Grafton pointed out that the first object of his Association, and of other similar bodies, was the extension of the knowledge of every individual member, and that each one should therefore do all he could for the welfare of the others. This, of course, includes taking an active part in the proceedings at the meetings. The contribution of papers on interesting subjects is absolutely necessary for the success of such gatherings; and those who hope to benefit by the labours of others in this direction should not refuse to give their fellow-members the advantage of their own experience in any respects that may be considered generally useful. Difficulty in securing promises of papers has frequently been experienced by the officials of the senior Associations; but this ought not to be the case with the juniors, who, being in their early days, have every aspect of all the branches of their profession available for treatment. It will be seen that, singularly enough, both Mr. Grafton and Mr. W. Hill, the President of the Manchester and District Junior Gas Association, referred to the need there is for the equipment of an experimental gas-works, and suggested that the expense of this might be defrayed out of grants made by companies and local authorities owning gas-works. Though the question is not, of course, by any means new, but has already often been considered, it is one that should, and we expect will, be kept well to the fore until some satisfactory solution of it is provided.

A Smokeless City.

The practical possibility of a smokeless city, even with present-day methods, and at no greater outlay than is expended on the existing imperfect system, has been maintained in the course of an interview which a representative of the Glasgow "Daily Record and Mail" recently had with Mr. A. H. Sexton, Professor of Metallurgy in the Glasgow and West of Scotland Technical College. The discussion arose out of a sketch of a smokeless city given by Dr. Stopford Brooke in the course of a lecture; and Mr. Sexton disagrees with the statement therein made, that the curse of the country is the smoke of the furnaces. He very truly points out that much larger contributors to the nuisance are the numberless domestic coal-fires which pour forth their smoke into the atmosphere without any regulation whatever—which is not the case with factory furnaces. The remedy for this state of affairs is, of course, a very simple one; and we are glad to see that of late it has been more extensively advocated through the general Press than used formerly to be the case. Readers of the "JOURNAL," know perfectly well what can, and ought to, be done to improve matters; but it is the owners of the fires themselves who have to be reached, and, as has been remarked on previous occasions, we heartily welcome the assistance of the daily papers towards this end. The rapidly increasing use of gas cookers and fires is already doing much to purify the atmosphere, and will do a great deal more; but Mr. Sexton looks very much farther ahead than this. His idea of securing a smokeless city is to have all the lighting done by electricity, and the heating by gas of a cheap character. There is, he says, no doubt that an efficient heating gas could be supplied at about one-third the cost of gas for lighting—in fact, gas for this purpose is being produced in some works in Glasgow at a cost of probably not more than 4d. per 1000 cubic feet, which, of course, does not include distribution. Tempting as this idea is, however, there is fortunately no need whatever to wait for its realization; for the more expensive gas at present supplied has so many advantages over coal for cooking and heating purposes as to make its general adoption desirable, quite apart from any question of the effect this would have in getting rid of smoke. But Mr. Sexton, it must be noted, draws a distinction between a smokeless atmosphere and an absolutely pure one, which he says is impracticable so long as combustion is necessary. He is, nevertheless, convinced that 50 per cent. less coal would be required for house heating, if it were first converted into a suitable gas, and that the economy which it is possible to exercise in the regulation of gas would count for much in the effect on the atmosphere.

Professional Auditing at Rochdale.

In view of the amount of attention that has recently been devoted to the important question of the auditing of corporation accounts, it is interesting to note what has happened at Rochdale. Here the Corporation came to the conclusion that, in addition to the work done by the two elective auditors, it would be advisable to engage a first-class firm of accountants to go through the books, and make any suggestions they might think necessary for the improvement of the method by which they were being kept. This course was adopted with regard to the accounts for the twelve months to March last; and the first result, which has already been noticed in the "JOURNAL," was a recommendation that the cost of the public lighting should be charged by the Gas Committee to the general purposes fund, instead of, as hitherto, being defrayed out of the profits on the gas-works. The Committee agreed to this proposal, with the result that the consumers have been relieved to the extent of about £5000 annually, which amount they had before been most unfairly called upon to provide for the benefit of the general body of ratepayers. This is not, however, the only change that is to result from the professional audit, for the water accounts have also come in for some attention, as well as the charges for interest on loans. The alterations that are to be made in these directions will be gathered from a report which appears elsewhere to-day; the amount involved being about £18,000, which has to be obtained from somewhere. The gas-works reserve fund seemed to the Finance Committee to offer an easy solution of the problem; but fortunately, owing to the strong opposition to this course offered by the Gas Committee and the Engineer, Mr. T. B. Ball, the attempted raid has failed. Under these circumstances, a penny rate for some years to come is the price that the people of Rochdale will have to pay for the knowledge that their accounts have been placed in an unassailable position. The satisfaction they must feel should be worth the price they are called upon to pay for it.

The Public Lighting of Reading.

The Reading Town Council are not showing any great anxiety or hurry in settling the question of the public lighting contract. The Mayor has given his word that, at the meeting of the whole Council in Committee on the 22nd ult., they did not commit themselves to light the tramway routes either with gas or electricity. Notwithstanding this statement, "coming events cast their shadows before;" and the shadows are strong ones in this case. A Committee have been appointed to see what arrangements they can make for the lighting by the Electric Company of the parts of the tramway routes in which wire ducts have been formed; the remainder of the borough being lighted with incandescent gas-lights. Some of the councillors, we fancy, from the attitude they are taking, see in this proposal—and rightly so—a prospective waste of the ratepayers' money; and there is some anxiety being displayed that nothing shall be definitely decided until the matter is again reported upon to the Council. The Corporation are in this peculiar position, that they have laid the ducts referred to, at a cost of, it is believed, about £2000; and certain of the members, we think, with a want of astuteness, are of opinion that, having spent the ratepayers' money on these ducts, they must at any cost use them. The construction of the ducts, of course, involves repayment of principal and meeting of interest. That is one loss; and if the Council adopt electricity for the lighting of the tramway routes, they will add to the loss another amounting, according to the Mayor, to £600 or £700

a year—this being the annual cost in excess of incandescent gas lighting. We maintain that, if the Corporation adopt electricity, they will be wasting this £600 or £700 of the ratepayers' money every year, simply because they were unwise enough to spend money on the ducts some time ago. One false step does not necessitate the taking of a second; and we trust the Reading Council will recognize this in time.

WATER AFFAIRS.

The Metropolitan Water-Works Arbitration.

THE real work of the Court of Arbitration under the Metropolis Water Act, 1902, commenced on Monday last week, when Sir Edward Fry, the President, and his two colleagues—Sir Hugh Owen, G.C.B., and Sir John Wolfe-Barry, K.C.B.—took their seats in the spacious hall of the Institution of Mechanical Engineers at Storey's Gate, Westminster, in front of a goodly array of learned Counsel and others more or less largely interested in one of the most gigantic arbitrations which have taken place in the history of water supply. The preliminary sitting of the Court in the spring to a certain extent cleared the ground for action; and the litigation was opened in real earnest on the above-named day. The claims sent in by the Water Companies amount, apart from their debenture stocks (which must all be taken over by the Water Board), to close upon £50,000,000; and against this sum stands the insignificant offer of £10,250,000 made by the Board. It had been arranged that the case of the East London Water Company should be taken first; and after the settlement of certain questions in regard to the representation of holders of King's and Adventurers' shares in the New River Company, whose case will follow, it was proceeded with. The Company claim, in round figures, about £7,250,000; and, as remarked on a previous occasion, the Board do not make them any offer whatever in respect of their ordinary stock. The Arbitrators sat daily till Friday, and practically the whole of the time was occupied in endeavouring to substantiate the claim; for it was only just before the adjournment of the Court till yesterday that Mr. Fletcher Moulton, K.C., the leading Counsel for the Board, commenced his address on their behalf. A report of the proceedings so far will be found in another part of the "JOURNAL;" and only an indication of the salient features will be attempted here.

The Company's case was laid before the Court, with his usual ability, by Mr. Balfour Browne, K.C.; and his first startling statement was that, having regard to the present position of the Money Market, they did not see their way to accepting water stock for their property, but wanted sovereigns. He said that the value of stock in the market had never been used as the real basis for determining the value of an undertaking, and he submitted that it should not be done in the present case. He contended that the value of a water undertaking to its owners was represented not only by the income they had been receiving, but also by the worth of structures which were not, at the time the income was measured, contributing to its production. Taking the Company's accounts for the past year, and making the necessary adjustments for certain abnormal elements, the learned Counsel arrived at the figure of £165,402 as the net maintainable income; and this multiplied by 36·36, the number of years' purchase which he said should be applied to it, brought out the total of £6,014,618. Adding certain other specified items, this sum was raised to £7,248,112, the amount claimed.

The first witness called was Mr. W. B. Bryan, the Company's Chief Engineer, whose evidence was necessarily directed mainly to furnishing the Arbitrators with particulars as to the extent of the area served, the sources and quality of the water, and the works employed in dealing with it. He was subjected to a long cross-examination by Mr. Moulton, in the course of which he stated that the Company did not anticipate expenditure of any kind upon reservoirs down to the year 1911, and that the existing sources of supply and their storage would be sufficient to take them on till 1923 without further outlay. The capital issued left a balance adequate to carry them on till 1911, notwithstanding the estimated increase of 200,000 in the population between now and then. With regard to capital expenditure, he said £2890 was taken by the Llandaff Commission as the normal amount due to increase of supplies for each additional thousand of the population; but these conditions did not apply to the Company. Mr. Bryan was followed by Mr. Daniel Hill, one of their Auditors, who explained in detail the adjustments in the accounts already alluded to, making up a total of £44,000, which they claim to add to their profits for last year. He said he had based his valuation on these profits, and not on those for an average of years, on the ground that the present condition of the Company's business showed it was likely to improve. Mr. Gane, a Chartered Accountant, who followed Mr. Hill, testified to a continual growth of the profits ever since 1896, with the exception of one year.

On Thursday, Sir William Crookes was called to speak to the quality of the water supplied by the Company, which he said was generally very good. He acknowledged that during last season some of the Water Companies supplied water containing more microbes than he and his colleague (Professor Dewar) considered it ought to have; but they were perfectly harmless. After this evidence, financial questions were again taken up; the witnesses called giving periods ranging from 33 to 34·5 years' purchase as the value of the undertaking. At this point, Mr. Charles Hawksley, Mr. E. M. Eaton, and Mr. G. R. Strachan were called to speak to the condition of the Company's works; and then Lord Rothschild brought the inquiry back once more to finance. He said the sort of security the shareholders of the Company would naturally wish to invest in could only be obtained on 33 years' purchase with ready money, or for a little more if payment were deferred, to secure the sellers against loss by variation in the market. Mr. E. Beckett Faber, M.P., who followed, expressed the opinion that share or stock holders whose property was being acquired compulsorily ought to receive such compensation as would assure to them the same income in amount as they were giving up; and the compensation should be paid in cash. He considered that for every £2 12s. 6d. of stable and maintainable income relinquished, £100 in cash should be given, and it should include all risks. This would be at the rate of about 37 years' purchase. Mr. Balfour Browne then proceeded to quote cases in support of his contention at a previous sitting of the Court that the City Chamberlain's sinking fund which had been imposed upon the Company was extinguished by the Act under which the inquiry was being held; and this brought their case to a close.

We shall now hear what the other side have to say in justification of the position they have taken up. They may possibly have reserved their strength for dealing with their case, as it did not strike one as having been very conspicuously displayed in cross-examination. Several times the President appeared to think that points were being needlessly laboured. The Board ought to make a fairly good show, with the assistance they have had from Mr. Haward, the Comptroller of the London County Council, in getting up their evidence; for there are few more conversant than he with the intricacies of the Metropolitan Water Question. He has not yet received permission to go into the witnesses' chair; but should this be withheld, the help he has already given must have been valuable. By this day week, headway will no doubt have been made towards the completion of the case now under consideration; and possibly the experience gained in this inquiry may simplify the procedure in regard to the others. But even in this eventuality, there is a good deal of work before the Arbitrators.

Mr. Richard Pope, of Westfield, Bonchurch (I.W.), for 25 years Chairman of Pope and Pearson, Limited, of Normanton, who died at the age of 73, left estate valued at £74,542.

It may be remembered that early in the year the honorary freedom of Lancaster was conferred upon Mr. James Mansergh, M.Inst.C.E., F.R.S., who is a native of the town, and was for many years Engineer of the water-works there. Mrs. Mansergh and the family were so highly gratified at the reception given to Mr. Mansergh on that occasion, as well as at the personal kindness and courtesy of the Mayor, Mr. G. Jackson, that they offered the Corporation a replica of the portrait which now hangs in the theatre of the Institution of Civil Engineers (Mr. Mansergh being a Past President of the Institution), and a sketch of the casket containing the freedom. These were subsequently executed by Mr. Palin, the painter of the original portrait. The gifts were formally accepted by the Council at their meeting on Wednesday, when pleasure was expressed at Mr. Mansergh's appreciation of the honour bestowed upon him. The portrait has been hung in the Council Chamber

ESSAYS AND REVIEWS.

THE GAS AND WATER STOCK MARKET.

THE position on the Stock Exchange really improved a little last week. It opened dull enough; and the bad weather made it even more depressed. But things cheered up when it was seen that the fortnightly settlement was not going to be a formidable affair—though one small failure was reported at the close; and a little genuine buying helped the upward movement. So that prices nearly all round (but not including Consols) show at the close some moderate advances upon their opening figures. In the Money Market, the demand was strong all the week in connection with the Stock Exchange and month-end requirements. But the supply was fully equal to it; and discount rates ruled steady. Business in the Gas Market was fairly active on the whole, though the volume of transactions was again to a great extent limited to dealings in the leading Company. The general tendency, as evidenced by the prices of the leading stocks, was favourable; but there were very few changes effected in quotation. In Gaslight and Coke issues, the ordinary was more or less busy every day. It opened with a much brighter aspect than it had shown at the close of the previous week, and at once rose a point. This was maintained, but not improved upon; and 87 was the best price on Saturday, which was half-a-point below the best of the week. Hardly anything was done in the secured issues; but the preference touched top-price once. South Metropolitan was very little dealt in; but the price was rather better, and on Thursday it changed hands at 119. Commercials were quite quiet and unchanged. In the Suburban and Provincial group, business was almost a blank; and quotations, both in London and the Provinces, were not altered. A deal in Alliance old was marked at the low figure of 18¾. Continental Companies were quiet and firm, except Union, which was two lower. Among the rest, River Plate was down, and Ottoman was up. There were more transactions in Water; and the tendency in general was flatter. But Southwark had a sudden rise, and changed hands on Saturday at 231. Attention has been riveted on the proceedings in the Arbitration Court, where the case of the East London Company has been dealt with. Among the witnesses called and examined were several prominent members of the Stock Exchange—dealers and brokers; and many of the public will have read with interest, and perhaps with some surprise, the testimony of these gentlemen that Stock Exchange prices are not to be considered as reasonable tests of value. We are glad to have this authoritative confirmation of the fairness of the remarks we have sometimes had to make upon these prices.

The daily operations showed little variation. The changes in quotation were: On Monday, Gaslight ordinary rose 1. On Wednesday, Ottoman rose ½. On Thursday, River Plate fell ¼. In Water, Southwark rose 5; but Lambeth fell 2½. On Friday, Kent new fell 5. On Saturday, Union fell 2. Southwark Water rose 4½.

ELECTRIC LIGHTING MEMORANDA.

Standard Electrical Pressures and Frequencies—The Pressures of Supply—The Marylebone Muddle—Electricity Generation and Dust Destruction.

AMONG the first-fruits of the Engineering Standards Committee's labours are the resolutions arrived at in respect to the electrical standards of pressure and frequency. These resolutions have been formally adopted, and have received the approval of the Board of Trade. They therefore possess all the necessary authority for designers and manufacturers of electric plant; and they should tend to simplify and economize work. The first thing to be noted is that the familiar term "continuous current," for one of the two forms in which electric energy is conveyed through the conductors, disappears, and is superseded by the more convenient term "direct current." It is therefore to be understood that henceforward this is to be the proper designation of the form of electric energy in question. At the same time, while admitting the greater convenience of the shorter term, and allowing that the genius of the English language is faithfully reflected in this aspect of the new technical term, it is possible to agree with the view of the "Electrical Times," that a purist might object to the change. The opposition between "continuous" and "alternating" as adjectives qualifying the noun "current" is plain; whereas the correlative of "direct" is "indirect." Still, something must be sacrificed for the sake of brevity of expression; and "continuous" must go by default of its four syllables, which makes it too long-winded for an often-repeated word.

As regards the proposed standard pressures themselves, there does not appear to be any serious objection to the recommendations of the Committee. For direct-current distribution to houses, the standard pressures are 110, 220, 440, and 500 volts. In deciding upon these pressures, the Committee had in view the requirements of consumers, and also the patterns of electric machinery in use and in process of construction. There are at present many different pressures declared by electricity supplying undertakers, which causes a good deal of dissatisfaction and confusion. Of course, these existing plants cannot be touched; but it should be advantageous all round, in the long run, to know exactly for what pressure to manufacture machinery and lamps. It will be noticed that the Board of Trade have been induced to accept 500 volts as one of the standards of pressure for the direct current. As a matter of fact, 480 volts is the maximum permitted for admission to consumers' premises. How the lamps are going to fare at 500 volts is one of the practical questions of the future. The inducement to go to this maximum was probably the existence of the same voltage for tramway traction. This uniformity would permit of the same traction and lighting current being used without any adaptation. The standard railway traction current pressure is 600 volts. The standard frequencies are 25 and 50 periods per second, for different applications specified. The latter is for mixed power and lighting on town supply mains, and also for ordinary factory power plant.

The Marylebone Borough Council, as in duty bound, have agreed to promote a Bill for amending their Electric Lighting Order in the sense required to permit of compliance with the direction of the High Court, as regards the purchase of the local business of the Metropolitan Electric Supply Company, Limited. The resolution was carried by a vote of 43 to 8, after strenuous opposition had been offered by Sir Edwin Galsworthy, who declared that not only were the Council not compelled to go for an Act of Parliament, but that there was no need for it. This is an issue for the ratepayers; for the Council could not refuse to do everything in their power to obey the order of the Court. How the King's writ will run against a whole population if, as is more than likely, they decline to support the Local Authority in their ill-advised proceeding, will be one of the most interesting of all municipal incidents to watch. There is a heavy bill of costs to settle, in any event; and the probability is that the ratepayers would prefer to wipe this off by an extra rate for a short time, to having anything more to do with municipal electric light. Meanwhile, the finances of those Metropolitan Local Authorities who do electric lighting have been much discussed in connection with the borough elections. There is no sure ground of principle to be distinguished in these debates, inasmuch as all parties claim everything that looks like a success, and charge the others with all shortcomings and defects. What the real state of municipal electricity supply in London is, few of the people who go in for local office appear to know for certain. Here and there, things are canvassed; but matters electrical are usually voted too complicated for the ordinary man's understanding, and passed over with meaningless generalities.

A strong and instructive report on refuse destruction in relation to electricity generation has been prepared by Mr. H. Mair, the Borough Surveyor, and Mr. G. C. Bell, the Borough Electrician, of Hammersmith, for the guidance of the Borough Council. This statement is one of the best exercises of the kind that has come under our notice—being comprehensive, incisive, brief, and very much to the point in every line. After traversing the subject from end to end with particular reference to the circumstances and needs of Hammersmith, the authors decide that there is no use in the locality for a destructor. When they turn their critical eyes to the examples of six other Metropolitan municipal electric light undertakings, three of them having the assistance of destructors and three being without, they find that the former combination costs more than it is worth, by about £2500 a year. That is to say, the extra capital costs due to the interpolation of destructors overbalances by this amount the apparent saving in fuel costs. Even this is not all; for the disadvantages of the combination in other respects are great, though they do not all appear in the accounts. The unfortunate electrical engineers who have to put up with the nuisance of a combined plant could tales unfold, but dare not. Of course, this is not to the detriment of dust destructors, in their proper place, but only goes to the demolition of another pretty municipal trading imposition.

Gas from American Coke Ovens.—The beehive coke-ovens between Altoona and Pittsburg probably make 20,000 tons of coke per day, from which about 100 million cubic feet of gas discharge into the air. This gas, if converted into power through gas-engines, would represent 5 million horse-power-hours, or the effort of about 104 gas-engines of 200-horse power each.

Southern District Association of Gas Engineers and Managers.—The next general meeting of the Association will be held on the 12th inst., at the Hotel Cecil, Strand, under the presidency of Mr. J. Tysoe, M.Inst.C.E. The business will consist of the election of the President, Vice-President, and officers for next year, and the reading of the following papers: "Economic Advantages of Working a Carburetted Water-Gas Plant in Conjunction with Coal-Gas Plant," by Mr. S. Carpenter; and "Other Troubles than Naphthalene," by Mr. J. Terrace.

Societe Technique Meeting in 1904.—Above the signature of the President of the Société Technique de l'Industrie du Gaz en France, M. Deleury, notices have just been issued announcing the date of next year's meeting of the Society. It will be held in Paris on June 14 and following days. Competitive papers have to be sent in by March 1, and other technical papers to be read at the meeting by May 15. It will thus be seen that announcements are made in good time, so as to give contributors every opportunity for preparing their papers.

A PROGRESSIVE JUNIOR INSTITUTION.

From small beginnings, the Junior Institution of Engineers has established for itself a place in the engineering world that commands the respect of engineers of all ranks. Its success alone needs only to be called to witness that it meets what was formerly a want. It was originated by some of the apprentices at the works of Messrs. Maudslay, Sons, and Field in 1884; the real founder of it being Mr. Sidney H. Wells, now the Principal of the Battersea Polytechnic. Mr. Wells and the half-a-dozen young men who joined him in laying the foundation of what was at the time nothing more than a club for mutual improvement, we venture to say, had not the faintest idea that twenty years later the small seedling would have flourished in such a remarkable degree that to-day a membership of 746 is counted. That is a proud position, and prosperity continues to attend the Institution. It will interest many readers to learn that Mr. Walter T. Dunn, now for many years the Secretary of the Junior Institution, formerly also of the Gas Institute, and now Secretary of the Institution of Gas Engineers, was at the time the organization started, an apprentice at the works where it really took root; and within six months of its foundation in June, 1884, he had joined his fellow-workers. The little group (whose number was not long in enlarging itself) had the same praiseworthy aims and objects that the Institution have set out in their opening rule to-day: "It is established and conducted to promote the interests of the junior members of the profession, in arranging for the reading and discussion of papers, and the dissemination of information on engineering and scientific subjects, the visiting of engineering and other works of interest, and in facilitating the mutual assistance and intercourse of the members." In all these things, they have achieved an abundant success; and therefore it is not astonishing that the accession of new members should continue at an excellent rate—for the past year, we think we are not far wrong in putting the increase at about fifty.

Although the meetings (excepting the excursion ones) are at present held in London, the Council are not unmindful of the claims to consideration of the constant extension of the membership beyond the range of easy attendance at the ordinary meetings. Of course, London has the larger representation; but a not inconsiderable part of the membership is now to be found scattered through the British Isles, and several (who cannot, in the nature of things, be legislated for) are now stationed in distant countries. In consequence, however, of this provincial growth, the Council have in view the spreading of the present effective work of the Institution by the establishment of Provincial Sections. There is no cut-and-dried scheme dealing with the matter yet before the Council; but they have taken the first step this session which will, in all probability, and perhaps at no distant date, end in the consummation of the project. This step is the election to the Council, for the first time, of eight members, representing the Provinces, Scotland, Ireland, and Wales. This has just doubled the former membership of the Council.

Before adverting to one or two other matters having a more direct bearing upon the current affairs of the Institution, it has been a matter of interest to see how far succeeding Councils have carried out the aims and objects set forth in the rules. We can say at once that the volumes of transactions, which are issued annually to the members, furnish incontrovertible testimony of a strict and faithful regard having continually been paid to the purposes of the organization. The papers are of a very meritorious order—instructive, well written, and largely based on the personal and special experiences of the writers. There are, too, the Presidential Addresses by men of great eminence in the engineering and scientific world, who—attracted by the successful endeavours and the enthusiasm of the members in their Institution—have gladly lent their countenance and encouragement to the junior members of the profession who have faith in the efficacy of united effort to promote their own interests in the ways already indicated. The first President of the Institution was Dr. A. B. W. Kennedy; and there has since been a long line of distinguished men in the presidential chair—ending in the current session with Mr. J. Fletcher Moulton, K.C., M.P., F.R.S., whose address to the members, by the way, has been postponed until Jan. 22 by reason of the heavy and responsible work which he has in hand in connection with the Metropolitan Water Board arbitrations. But another feature which is of great importance are the visits to engineering works; and the members have been most kindly received, in the past twenty years, at a large number of works of diverse character. The list shows gas-works among the number—the works at East Greenwich, Fulham, Gravesend, and Kennington. Then there is the summer excursion which is, of course, the event of the year. Thus there has been an assiduous endeavour to live up to the high standard of usefulness which the Institution have outlined in their opening rule.

The mention of the varied character of the work done suggests another point, which opens a good inducement for those who are confined to one branch of engineering to become members; and that is that the variety of engineering subjects brought before the members in the papers and at the works visited, must have the effect of broadening their knowledge by inviting their interest to take excursions beyond the limitations imposed by their own special branch of work. In the papers, gas has only received occasional treatment; but it is one of the objects of this article to incite an interest in the Institution, and so to bring the gas branch of engineering into greater prominence in the proceedings. This year is a specially favourable one for making this effort; and the moving spirit in this direction is Mr. Samuel Cutler, jun., who has been appointed Chairman for the present session. Mr. Cutler has for many years—from his election in 1891—taken a lively interest in the Institution, and has been a good worker—not only in the background, but by introducing to the members engineering questions with which he is specially identified; and his election to the chair is a recognition by the members, and the reward, of his activity in promoting the objects of the organization. His long-continued association with the Institution suggests a pleasing point in connection with its membership; and it is this—that (though it may be a good drilling-ground for the shaping of future active members for the senior Institutions) the members, with promotion in the ranks of the profession and with increasing years, do not forsake the old organization of their early professional days. There are in the list several names of gas engineers who have their own responsible managements, which some of them had not when they first became identified with the Junior Institution. Glancing through the names, we notice those of Mr. J. H. Crowther, Mr. George Wadeson, Mr. S. O. Stephenson, Mr. Lawrie Trewby, Mr. John Mitchell, Mr. Frank Mitchell, and Mr. W. Fendick. There may be others. Therefore, those junior engineers of the gas industry who are tempted to join the Institution will not find themselves in a state of isolation. In the current session, it is noticed that Professor Capper is down for a paper on "Recent Developments in the Construction and Working of Gas-Engines;" there is a paper on an industrial application of producer gas; and Mr. Fletcher Moulton's address is sure to be of general interest.

We hope that Mr. Cutler's aspirations to further the claims of the Institution among the junior members of the gas industry will be fulfilled. Exclusive culture of the intellect has no part, nor ever has had, in our beliefs. It is good for men to rub shoulders with, and glean new ideas from, those connected with other branches of the profession. The Junior Institution offers the opportunity. It is a powerful organization; and we hope its influence and prospects will continue unceasingly. The more of such good work as this, the better for the future of the great engineering industry in the various paths of which the members have cast their lot.

GAS COMPANIES AND IRONMONGERS.

Scarcely a week passes without our estimable contemporary, the "Ironmonger," having something to report concerning the alleged crowding of "the trade" by gas companies and corporation gas departments. The subject is of considerable importance, one is led to believe, in a good many towns where the ironmonger is engaged in the struggle to keep his standing against the encroachments of co-operative stores and other rival shopkeepers, and in some localities plays the part of the proverbial "last straw" in breaking down the specialist of the black apron. The circumstance that the loudest complaints come from places where Trade Protection Societies are more highly organized, is only what is to be expected; for an organization of shopkeepers, like a Trade Union, is never healthy if it is not aggressive. The moment such a Society ceases to be combative, it begins to drop towards its end. Let us remark at once, that the wanton and uncalled-for interference of a gas company in the business of an ironmonger is not defensible. Though ironmongers themselves are by no means constitutionally averse from starting a branch or pushing a "side line" which has no connection with their main trade, gas companies would be among the last commercial people in the world to take the bread out of the mouth of a ratepayer and gas consumer, even if there were no such fellowship of interest between the parties as exists in the case of gas manufacturer and ironmonger. In regard to the alleged crowding of ironmongers by gas companies, however, it is necessary to particularize. The grievance is based on a twofold proceeding, in which one part is pretty old and the other is of comparatively recent date. Gas-stoves and incandescent burner maintenance supply the two counts of the indictment. It is unnecessary to state the details of the complaints which arise from the dealings of gas undertakings in these respective accessory lines, especially as the sore points differ in different towns.

As regards the lending of gas cooking-stoves by gas companies and local authorities, which is an ancient story now, it has been shown in these columns over and over again that the complaint of "the trade" never had any justification in fact. The gas companies did not take away any business from the ironmongers, for the simple reason that it did not exist. And the trade of the ironmonger in gas cooking and heating stoves had no existence, because there were no satisfactory articles of the kind to sell. The gas companies had to take a leading part in evolving suitable gas-stoves for all purposes, before they could put their money into the stove-lending business. The trade never attempted to do anything of the kind. Probably ironmongers could not have stepped in, as the gas companies did, to see that the user of gas for cooking and heating got the appliance he wanted. But the fact remains that the trade did not perform this service, and the gas companies did. After all, however, it might be argued that

the ironmongers in general gave up the struggle too quickly and easily. There must be a large number of gas consumers who could be persuaded even now to buy right out good stoves of their own, instead of going on paying the fairly substantial rents charged by most gas undertakings for the use of these articles. Unless our information is incorrect, there are few gas undertakings which have been satisfied with the result of a "hire-purchase" system of furnishing stoves. The rental in this arrangement is too high to suit the average consumer. A mere rental charge, and a low one at that, is most popular. Yet even so (and it is a point which we freely commend to the attention of the trade), the stove hirer is necessarily at the mercy of the gas company. Not that the company will knowingly send out a bad article; but they must often require the consumer to be content with an old one cleaned up. Here, again, this may be no real disadvantage to the stove user; but the fact might be taken advantage of by a really sharp tradesman to sell a smarter article to a customer who could afford to buy.

As regards the second point—the maintenance of incandescent gas-burners by gas companies—this is really, as we have often argued, entirely the fault of the ironmongers themselves. They had a preference once, from the old Welsbach Company, which they one and all despised and wasted. It is not surprising to learn that now the gas companies do maintenance so largely, the ironmongers are in some places thinking of doing the same thing. We desire to assure "the trade," once for all, that if they will only undertake this branch of usefulness, the gas companies and local authorities will be only too glad of their assistance. There was a letter from Bournemouth, in a recent issue of the "Ironmonger," which described how a local firm had "had the pluck to copy, and in a way fight, the Gas Company." The firm reported after twelve months' trial, that they are perfectly satisfied with the results. "In their opinion the business pays for itself; but a great point is, that a wide-awake mechanic can pick up other repair work at the time of his weekly visit, besides orders for new goods." Why, of course! What have "the trade" been dreaming about all these years, that they have overlooked this opening?

Here is a consideration, then, which should sharply commend itself to an enterprising tradesman. Gas companies who undertake the maintenance of incandescent gas-burners have no monopoly in it. They could not, if they would, prevent a competent shopkeeper from offering to compete with them in this respect; and most gas managers would be only too thankful to be spared the trouble, which does not, as a rule, bring them any personal compensations. And, in any case, the gas companies' men have no interest in the state of the sash-lines or door handles, to say nothing about electric bells and the plumbing. Live and let live is a good rule; and it must be a tradesman's own fault if he, working for his own hand, cannot meet the so-called competition of a local authority or a statutory company in a matter which has nothing to do with the employment of large capital resources. Besides, there are all manner of fancy articles and fittings connected with incandescent gas lighting which it is no business of the gas company to deal in or to recommend. This should be in the ironmonger's way; and if he cannot adapt himself to the circumstances of the day, and push this branch of trade in the householder's home, instead of waiting for the incurious citizen to come to his emporium, he deserves to lose his custom.

THE FUTURE OF "SLACK."

It is a great point in recent "power gas in bulk" schemes that the raw material used is small coal, or slack, which is assumed to be obtainable from almost any colliery in any desired quantity, without the price being raised by the increased demand. This particular feature of these projects is peculiar to them. The idea of depending for cheapness of working on the employment of a low grade of raw material, in the commercial sense, was no part of the older proposal of the late Sir William Siemens, to transplant ordinary gas-works to the pits, and pipe the gas thence to the towns. Sir William did, however, think of the proportion of coal which is usually lost by reason of its being too small to send away from the pits; and to this extent, therefore, he did believe in the use of slack for gas making in bulk. There is reason to think, however, that the quantity of good coal lost to industry in the form of unmarketable slack, or even a lower grade of the output, is nothing like so large as is sometimes pretended in order to support a scheme. The question of the quantity of small coal made in mining, and its applications, was one of the matters to which the Royal Commission on coal supplies gave particular attention. The statements on this head made in the evidence taken by the Commission are very interesting, as illustrating the effect in raising the value of what was at one time a waste product, of modern means of utilizing it. Mr. W. H. Routledge, a mining engineer and colliery manager of great experience, assured the Commission that during recent years the value of small coal has tended upwards relatively. So much is this so, that probably in the future all the small coal made will be sent to the surface and used there or sold off. The more washing is done, and the more coke is made from it, "the more, there is no doubt, will the price of small coal continue to increase." Washing to remove the dirt, and the increasing use of the bye-products coke-oven, are having this tendency. Other witnesses said the same thing. Coking is the best use that can be made of small coal; but if it is washed, it is possible to sell it mixed with the round coal for various purposes.

It seems to be pretty generally considered, moreover, that as the employment of coal-cutting machines extends, the proportion of small coal made will be reduced, perhaps by 5 or 10 per cent. in the case of the generality of seams. This is another reason for regarding the imagined plentifulness and cheapness of slack as very much of a "broken reed" for the gas manufacturer to rely upon. It appears to be the fact that the margin of difference between the price of the round coal and the price of the small is less than was formerly common; and this difference is constantly tending to diminish. The latter is the more important consideration for those who may think to manufacture any kind of gas cheaply from slack. It looks rather as if this notion of the cheapness of small coal would have to be abandoned, as referring to an obsolete condition of things in most coalfields. Speaking of Monmouthshire, Mr. Routledge said that he had himself put up three large washing-machines—one to deal with 800 tons per day, and two to deal with about 650 tons per day each; and the result of it has been that the nut coal and pea coal which has been taken from the small coal, has displaced in many cases the use of large coal, and has at the same time prevented so much of what was known as small coal being in competition in the market. As a matter of fact, the Tredegar Company, who used to be selling 2000 to 3000 tons of small coal per week, now produce nuts, peas, and a residue passing through the $\frac{3}{8}$-inch screen, which is coking coal and goes to a different market. The Rhymney Iron Company are doing the same. Instead of throwing large quantities of slack upon the market, they are treating it themselves, and selling it as washed nuts and peas. The remainder is coked. It is the same with the Ebbw Vale.

Mr. T. E. Forster, speaking of the Northumberland district, said there is now no small coal left underground, or put into large heaps on the surface. Fifty years ago, 20 per cent. of the small coal was thrown back into the pits, because there was no market for it. Now there is a sale. The improvement in some cases in South Wales only dates from two years ago, and a good deal is sold for briquette making. There is a considerable export of small coal for the latter purpose. In the case of the South Yorkshire pits, a great change has been brought about by the bye-products recovery ovens. Mr. H. S. Childe spoke of a colliery producing about 500,000 tons yearly, which had about 100,000 tons of small stuff. This is being rapidly washed and sold off. The whole of the coal is now taken out, and the small that will not coke is burnt under boilers. All the big Barnsley pits have these bye-products recovery coke-ovens, which reduce the cost of working over the colliery as a whole. Mr. C. E. Rhodes stated that the modern methods of dealing with the small coal, and making it into coke, have in many instances enabled collieries to carry on during times of depression, which they could not possibly have done otherwise. The small coal used to be sold at about 1s. or 1s. 3d. per ton, whereas now the colliery can afford to charge it against the coke-ovens at 3s. 6d. and 4s. per ton. This does not look as if there would be much slack available to send away. Formerly riddles were used in the pits, when 8 or 10 per cent. of the small coal was left behind. Now it is all put out, and the small is coked. The coke is used mostly in blast-furnaces; but that made from the very best coals goes to the steel-smelting works of Sheffield. The introduction of steel in place of iron has largely increased the Sheffield demand for coke. In North Derbyshire the small is still left in the pit because it is non-coking and unsaleable. The extent of the coking at the pit's mouth in Yorkshire amounts to a revolution; but the quantity of coking residuals recoverable is found to vary a great deal with different coals.

The general conclusion to be formed from the whole of this evidence is that, whatever may have been the case fifty, or even thirty, years ago, there is absolutely no opportunity now for erecting a gas-manufacturing process of any kind upon the difference of value between small and round coal. The enormous waste that used to go on (below ground and at the pit's mouth) in preparing round coal for the market, has been almost entirely stopped. Much more small coal is now sent away with round, to ordinary purchasers. The large extension of the practice of washing the coal, and the success of the bye-products recovery coke-ovens, have together revolutionized this branch of the coal industry. There may still be small quantities of slack locally available at cheap rates for gas making on a moderate scale; but these exceptional instances do not afford any trustworthy indication of the prices at which large orders for slack could be filled. It is only their insignificance which allows such examples to exist. Henceforward, therefore, it will be distinctly safer, in calculating the results of gas manufacturing schemes, whether for power purposes in bulk or otherwise, to discard altogether the use of the questionable term "slack," as likely to prove misleading, and to take the raw material, coal, at the ordinary market price for the average quality of the article. As Mr. H. H. Bolton, junr., of the Accrington Collieries states, even when coked in beehive ovens, the price realized for the slack in the form of coke is fully equal to that which would be obtained for steam coal sold locally. This statement appears to dispose finally of the antiquated pretension that, for working on a large scale, there is any advantage to be gained by using slack instead of ordinary grades of coal.

INCANDESCENT GAS LIGHTING IN FRANCE.

In the current number of "Le Gaz," M. Jouanne deals with the development of incandescent gas lighting in France. In the course of a few introductory remarks, he points to the fact that incandescent burners are gradually superseding the old batswings for street lighting, just as years ago these displaced the old types of smoky lamps; and he hails it as an indication of progressive evolution which not only embellishes the public thoroughfares but facilitates traffic. He then proceeds to mention a few towns in which the incandescent lighting system is to be tried, taking them in the order of importance and the number of lights.

At Nantes, the alteration of the lamps has been entrusted to the Société Anonyme des Anciens Etablissements Lacarrière, who last year carried out similar work at Dijon. At Nantes, there are 1700 lamps to be altered and 500 new ones erected; making a total of 2200 incandescent burners. The type of burner adopted by the Municipality, after comparative tests which have been made for nearly a year, is the Lacarrière (on the Houdaille and Triquet system), consuming 3·5 cubic feet of gas per hour. This burner has been referred to on several occasions in the "Journal." Ignition will be effected by means of the alcohol spray lamp, terminating in a small tube, which enters the lantern through a torch-guide. There is consequently no danger of its striking against the mantle; and, on the other hand, the opening in the base of the lantern shuts automatically after ignition, so that it is hermetically closed, and the light burns under the most favourable conditions. This system has since last year been in use at Dijon with 2300 lanterns.

In August last, the Municipality of St. Quentin concluded a contract with the Gas Company for the adoption of incandescent lighting for all of the public thoroughfares. Welsbach burners (Nos. 2 and 3), consuming 3·5 and 5 cubic feet of gas per hour, are to be used. Lanterns belonging to the Municipality are to be altered by the Company at the fixed price of 15 frs. complete. The lighting power of the No. 2 burners is to be 57 candles, and of the No. 3 burners 96 candles. The mantles are to be replaced when they have lost two-thirds of their power. The average number of lighting hours per lantern per annum is not to be less than 3193. The price per hour to be paid for each No. 2 burner is to be 2·04 c., and for each No. 3 burner 2·7 c. These prices are to include the supply of gas, interest and repayment of capital required for the alteration of the lanterns, mantles, burners, and chimneys, and their replacement, maintenance, &c.

The general use of incandescent burners at Boulogne-sur-Mer has led to an agreement between the European Gas Company and the municipal authorities, whereby the Company have obtained an extension of their concession for eight years (from 1932 to 1940), on condition that they will undertake to change all the ordinary burners to Welsbachs, consuming 3·5 cubic feet of gas per hour, and put up 100 new lanterns furnished with similar burners; the lamps to be kept alight all night. The lanterns, burners, and mantles are to be maintained at the contract price of 5 frs. (instead of 12 frs.) per lamp per annum. By this change a great improvement is effected in the public lighting, inasmuch as it is almost quadrupled by the adoption of incandescent burners. In fact, 1087 burners distributed throughout the town represent about 43,480 decimal candles; whereas the 1018 burners of various kinds previously employed were only equivalent, at most, to 12,060 decimal candles. Owing to the reduction in the annual cost of maintenance from 12 frs. to 5 frs., vastly improved lighting will be assured without any increase in the amount (78,350 frs.) inscribed in the budget for the present year.

At Melun, the Gas and Electricity Company have entered into an agreement with the Municipality for the introduction of incandescent burners. Under a contract dated Jan. 1, 1900, the Company were to carry out certain works for the supply of current during the daytime. The period originally fixed for the completion of these works is extended to Saturday last (Oct. 31), on condition that the Company put up, at their own expense, 89 lanterns with No. 2 incandescent burners, in place of those fitted with batswings consuming 5 cubic feet of gas per hour—no increase being made in the charge. When the lighting power of a mantle has been reduced 50 per cent., it is to be changed. The price remains at 2·75 c. per lamp per hour. If at any time the Municipality desire to alter other batswing burners to the incandescent system, the Company are to be entitled to charge 35 frs. per lamp by way of compensation; and in the event of the extension of the town necessitating the installation of new incandescent lamps, they are to be allowed 15 frs. each for them. These conditions are to be subject to revision every five years.

The Gas Company at Issoire, in the Puy-de-Dôme, finding themselves confronted with an agitation for the introduction of electric lighting, have just made a proposition to the Municipal Council which it is expected will result in a satisfactory arrangement being come to. The Company undertake to raise the number of lanterns from 86 to 160, and transform all the batswing burners into incandescent ones, having a lighting power of 32 candles. Moreover, they will supply gas for light and heat to private consumers at a uniform rate of 30 c. per cubic metre (6s. 9d. per 1000 cubic feet). In this way, the street lighting will be almost doubled as regards the number of lamps, and more than trebled in illumination. These improvements will not involve the town in any other expense than its share of the cost of the new lanterns, in accordance with the conditions of the contract. The resulting increase of light will be an undoubted advantage to all, and will, it is believed, give complete satisfaction to the inhabitants, who will also be benefited by a reduction in the price of gas.

AN AMERICAN TREATISE ON GAS-ENGINES.

The subject of the construction and working of gas-engines is one which has been very thoroughly dealt with by several competent authorities in this country; but on the other side of the Atlantic it has been rather neglected. The largely increased appreciation of the fuel-value of blast-furnace gases, and a wider extension of the manufacture of fuel gas in producers, which have of late years been witnessed, have, however, had for result the more general adoption of gas-engines for the production of motive power, especially for electric lighting and the compression of air and gas. This being the case, there appeared to be room for a comprehensive treatise on this convenient form of motor; and it has been produced by Mr. F. Remsen Hutton, the Professor of Mechanical Engineering in Columbia University.* The book possesses considerable interest from the fact that it is the first important American contribution to the subject of which it treats. The author relegates most of the records of past achievements to a few pages in an historical summary at the end—selecting for illustration and criticism the modern American forms of engines which are typical and suggestive.

The first three chapters are introductory, reviewing the physical properties of the hydrocarbons for power purposes, and the necessary preliminary definitions and constants to be used in discussions of internal combustion engines. There is much that is new on gasoline, kerosene, and alcohol for power purposes. This leads naturally to the treatment of the succession of events, or "cycle," which will appear when a gas or liquid fuel imparts to air the increase of its energy due to combustion, and that energy is exercised upon an engine piston. The mixture of fuel and air will pass through its cycle, provided the fuel energy is properly supplied, whether the motor operates with gas or with gasoline, with kerosene or with alcohol. A chapter is given to each kind of engine; those on gasoline automobile motors and on kerosene and alcohol engines being entirely new, as they have only become possible since the automobile motor has called for the development of these types.

The problem of the internal combustion engine is also a novel one for the motive-power student, by reason of the demand for a device whereby the proper proportions of fuel and air shall be introduced into the motor cylinder under all variations of load, and in the motor-car under all variations of speed. This requirement has resulted in the creation of a "carburettor;" and in the tenth chapter is brought together an analysis of the systems in use, and a description of some typical forms. Similarly, there are chapters treating the problem of igniting the charge of fuel and air for the working stroke of the engine, and the requirement of governing the effort of the piston as the load varies. These are both original in their completeness and scope.

The engine of the internal combustion type has been often accused of being unreliable or tricky in its behaviour in use. A chapter is devoted to the manipulation of the gas and gasoline engine, the detection of the defects which cause improper working, and the problem of starting the motor after a stop. The methods of testing gas-engines for their performance and economy also receive full discussion, and a form of log is given for the data of such tests. A complete tabulation of the performance of engines with various fuels will also be found of exceptional value for comparison and for record.

Probably the most noteworthy chapter for the student and expert is that which gives an exhaustive mathematical analysis of the behaviour of the heat liberated in a gas-engine or its derivatives when operated under the usual cycles. The cycles are compared with respect to temperature, pressure, and volume for a given addition of heat, and likewise also with respect to efficiency. Graphical solutions are also given, with a view to enabling the deductions to be used in calculating the mean effective pressure, and from it the required cylinder sizes for a certain horse power. Some attention is paid to the problem of heating air at constant pressure, with a view to the use of a gas-turbine as a motor; and some valuable data on the action of explosive mixtures of gas and air are collated. An historical summary and brief bibliography conclude the treatise. The text of the book occupies 483 pages; and there are 243 illustrations.

The interest attaching to the distinctly American atmosphere of this book will increase its value to many readers; and the full and satisfactory treatment of the problems of carburation, ignition, governing, and manipulation will commend it to those who are really in practical touch with these questions, either as makers or as users.

* "The Gas-Engine. A Treatise on the Internal Combustion Engine using Gas, Gasoline, Kerosene, Alcohol, or other Hydrocarbon as Source of Energy." By F. R. Hutton. New York: John Wiley and Sons (London: Chapman and Hall, Limited); 1903.

ENLARGEMENTS AND IMPROVEMENTS AT THE STAFFORD CORPORATION GAS-WORKS.

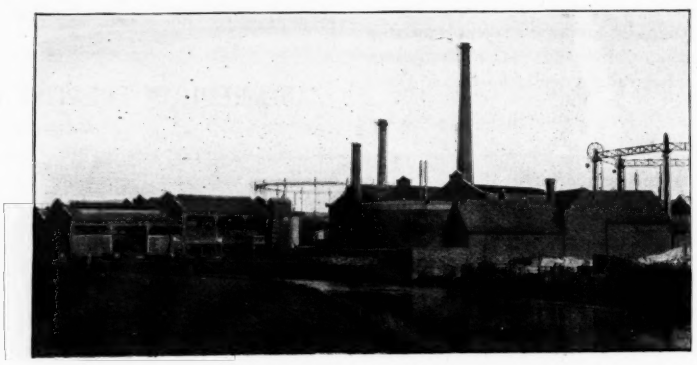


FIG. 1.—GENERAL VIEW OF THE WORKS.

BETWEEN water-gas systems of to-day and a water-gas process of a day long since past, the Stafford Corporation Gas-Works provide a link. We have it on the authority of Mr. J. R. Frith, of Runcorn, who many years ago was connected with the Stafford works, that, a little more than half-a-century since, a piece of the ground

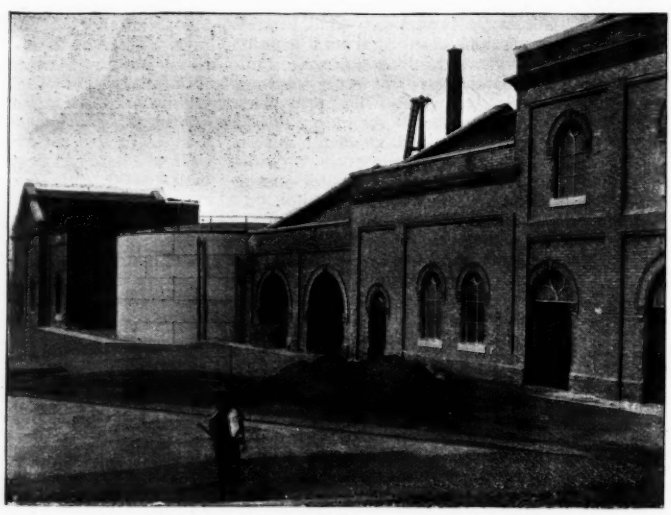


FIG. 2.—SULPHATE-HOUSE, BOILER-HOUSE, AND WATER-GAS BUILDINGS.

now occupied by retort-settings there, had upon it one of White's water-gas plants. To-day, not far from the site of that almost forgotten process, stands a new plant of the Humphreys and Glasgow type. This little historical fact clothes the latest addition to the productive power of the works with rather more than ordinary interest. The records of the past do not give us any particulars bearing specially on the experience with the Stafford installation of White's system, of fifty years or more ago; but anyone who desires to investigate further into the features of the process will find a good commencement for his researches in some references to it by Professor Lewes in his lecture to the Institution of Gas Engineers in 1900.

However, it is not with the past but with the present that we are more immediately concerned. The last three years at Stafford have been, in the making of extensions and renewals, busy ones for the Engineer (Mr. Hubert Pooley, Assoc.M.Inst.C.E.). The removal of Mr. J. Ferguson Bell to Derby, and the advent of Mr. Pooley to Stafford came at an opportune time; for, in the nature of things, an Engineer who is going to shoulder the responsibility likes, if possible, to have a word in the planning, and to superintend the erection of new plant with which he is going to operate. It was in 1900 that it was determined to make further changes in the works, and so fortify the productive capacity; and just before Mr. Bell relinquished the engineership, it had been resolved that the supplementing of the capacity should be by the installation of a carburetted water-gas plant. And so it came to pass that, as soon as Mr. Pooley was settled at Stafford, his attention had to be centred on new constructional work.

In some respects the extensions and changes were imperative; but a greater influence, so far as the water-gas plant was concerned, was the desire to be well ahead of requirements, to ensure a large margin of safety in complying with any possible demand—emergent or otherwise. The gas consumption goes on increasing, as it has done ever since the transfer of the works in 1879, with only one break, and that was the year following the opening of the electrical works in 1895. Here we have at Stafford one of the few examples of single control, in respect of administration and engineering, over the Corporation Gas and Electricity Departments; and a very indulgent attitude is maintained towards the newer branch. But there is no favouritism. If anything, on the business side, the younger illuminant is pushed, in order to broaden its foundation and revenue-producing capabilities, against the older illuminant. The increase in the electricity revenue goes on steadily year by year; and within the last year or two, the financial side of the concern has been improved by the very material saving that has been effected in the working expenses. But the claims of interest, repayment of capital, and depreciation leave (as is seen by the last report of the Committee) a fairly substantial deficiency. Yet the older illuminant ploughs its way through the opposition, and unfailingly adds to its output year after year; and, with the careful watch that is exercised over the internal affairs and operations, the undertaking thrives. Last year, the total amount of gas sent out from the works was 174,083,000 cubic feet. For the year ending March, 1900 (shortly after the close of which year Mr. Pooley took charge), it was 157,908,000 cubic feet; and in 1893, it was 121,118,000 cubic feet. We have spoken of one of the incentives to the installation of new carburetted water-gas plant being a desire for safety. The retort-settings at present in working condition are equal to the production of abont 1 million cubic feet per diem. When the whole of the settings are in complete order (they are not at present required), the house will be equal to an output of 1½ millions; while the water-gas plant has a present capacity of ½ million. But the maximum daily

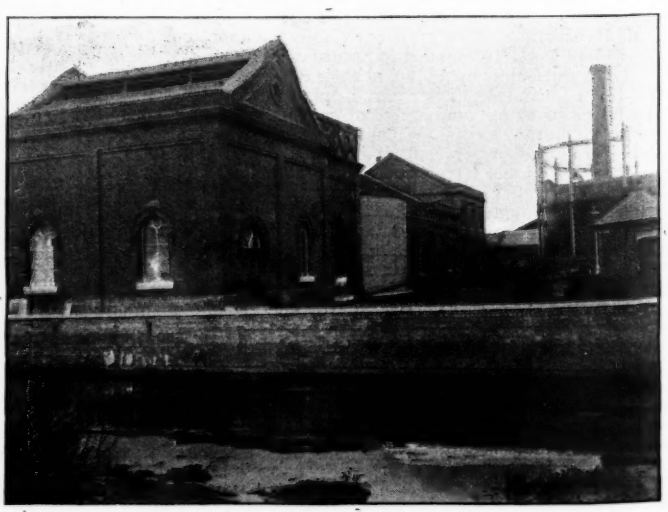
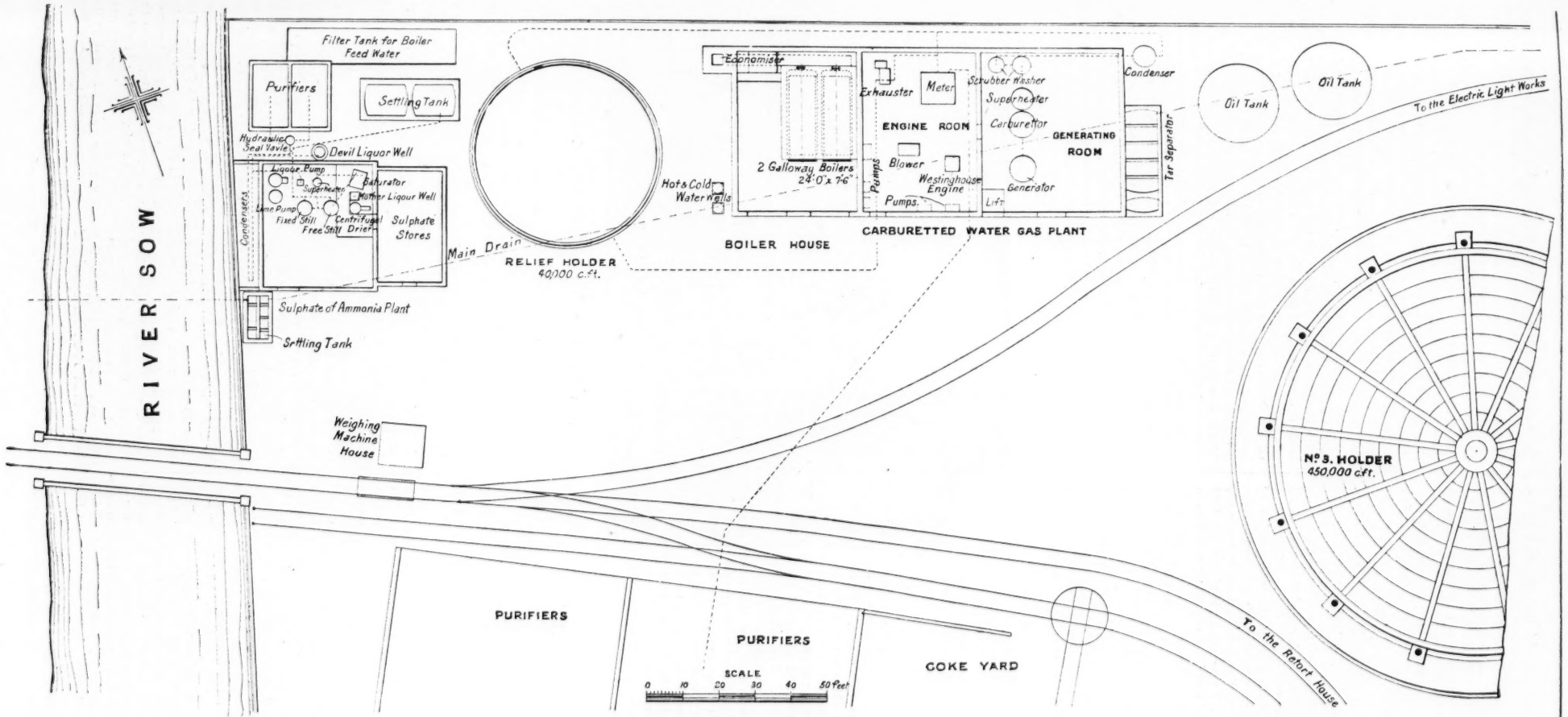


FIG. 3.—SULPHATE-HOUSE—VIEW FROM THE RIVER, LOOKING EAST.



General Plan of the New Section of the Stafford Corporation Gas-Works.

output of gas last winter was 800,000 cubic feet; while the total storage accommodation is only 705,000 cubic feet. The water-gas plant has therefore removed all anxiety in respect of a deficiency of storage accommodation, and has given the Engineer a means of meeting sudden variations in business, or coping with other fortuitous circumstances, which no additional holder room with any number of cold retort-settings would place at his command.

These few particulars from the soundings taken as to the position which led to the making of the new extensions and alterations, suffice as a preface to the description of the new buildings and plant, the greater part of which are found at the north end of the works—being, as the plan (which Mr. Pooley has kindly had prepared for us) will show, comprised in a range of structures lying between the River Sow and the largest holder on the works, which has a capacity of 450,000 cubic feet. The range consists of the water-gas buildings—the generator-house, tar-separator, engine-room, boiler-house (from which steam is now supplied to the whole of the gas-works), two oil-storage tanks, relief holder—and the sulphate house and store. The sulphate house is close on the bank of the river, and the water-gas buildings end in proximity to the large gasholder.

The ground at this end of the works required a good deal of rough levelling before the actual extensions began; and then followed what perhaps was the most difficult and wearisome part of the work. All engineers at Stafford have found that the site possesses one immense subterranean defect, which prevents it from being classed as a good all-round site for such heavy plant and buildings as those of gas-works. The works are situated on a peat bog from 30 to 50 or 60 feet deep. The first 15 feet is peat bog, then there is about a 5-feet stratum of quicksand, and the remainder, so far as is known, is also peat bog. The instability of this for foundations has been almost heartbreaking for the Engineers; and it has been a question of keeping a very alert eye on the various structures for signs of subsidences. The works in parts bear severe traces of these underground movements. Of course,

to get anything like security, heavy pile-driving has had to be resorted to; and in the new range of buildings, Mr. Pooley thinks—he is too prudent a man to say he is sure—that he has fully safeguarded himself and the structures in this respect. The piles he drove down through the treacherous ground were 12 in. by 12 in. pitch-pine baulks, in lengths of from 35 to 45 feet, and spliced where necessary; and the necessity must have arisen in several instances, seeing that the depths to which the piles were driven (at frequent intervals over the surface) varied anywhere between 36 to 58 feet, and deeper still in one spot. For the water-gas buildings, the piles were driven, at a distance of about 7 feet centres, to an average depth of 40 feet; and for the relief gas-holder they were sent down to depths varying between 36 and 58 feet. Altogether 37 piles were sunk for the relief holder; and cross timbers were secured to the heads of these, so as to form a cradle on which the concrete was built. A careful record of all this heavy piling work has been preserved.

The driving of such a number of piles made the preparation of the site the most tedious part of the whole work involved in the extensions. The buildings were immediately afterwards proceeded with. The area of land which they now cover is about 320 feet long by 70 feet wide; and they make quite an imposing section in the works. The ground measurements of the respective buildings are: The generator-house and engine-house, 48 ft. by 85 ft. 6 in.; the boiler-house, 48 ft. by 35 ft.; the relief holder, 50 feet diameter; the sulphate house and store, 53 ft. by 32 ft. The two oil-storage tanks are each 23 feet in diameter.

Dealing first with the water-gas buildings (fig. 2), the foundations above the pile-heads are of concrete. The bricks are all of local make—Rocester pressed; the sills, steps, flag-stones, and most of the string courses are constructed of concrete, made on the premises. The saving effected in stone work in this way amounted to quite 2s. 6d. per cubic foot. The roofs are light and simple in design, and made up of standard steel sections; so that very little labour had to be expended upon them. Half the roof in the generator-house is glazed; as is also about one-fourth of the roof of the engine-house. The other parts of these roofs and of the whole of that of the boiler-house are slated, and the slates attached to the rafters by galvanized iron nails.

As to the sulphate-house (figs. 2 and 3), the piling required here had to receive special attention; the ground being particularly soft at this point. The piles varied in depth from 43 feet to no less than 85 feet; and under the main walls double piling was resorted to. It may be safely stated that Mr. Pooley knows much more now about the work involved in deep pile-driving than he did before. The sulphate-house is built of Colwich brick, and arch-bricks from Heather (Leicestershire). The whole of the buildings were erected to the plans of Mr. Pooley (except the generator-house roof, which was designed by Mr. Bell before leaving Stafford); and the building work, except that involved in two of the roofs, was carried out by the Gas Department's own men. The two roofs referred to are those over the generator and boiler houses; the former being constructed by Messrs. Handyside and Co., of Derby, and the latter by Messrs. C. & W. Walker. The structures are all of the same style throughout—with just sufficient inexpensive relief work on their exteriors to give them a pleasing appearance, and remove from them the charge of being absolutely plain. Besides, they harmonize well with the more recent of the older buildings on the works. In their construction, economy has been studied, but not at the sacrifice of strength; and they are well schemed for their respective purposes.

Inside the generator-house, the walls are found to be lined with enamel glazed bricks, supplied from South Buckley, near Mold; and the same style is adopted through the other houses. The white glazed bricks with the part-glazed roofs and windows make the generator and engine houses beautifully light, and impart to them a very agreeable airiness, as witness the very clear photograph obtained of the operating-floor in the generator-house (fig. 4). The floor of this house is composed of blue bricks, set herring-bone fashion; while the floor of the adjoining engine-house is made up of Cleehill granite chippings and cement—thus making practically a granolithic floor. It forms a splendid wearing surface, and has an excellent appearance for an engine-room. It was also noted that all the steam and blast pipes are readily accessible, being laid in trenches with light cast-iron covers; and the same system is followed in the case of pipes running outside the buildings, with the exception that concrete flags are here used as covers.

The equipment of the houses is of easy description—the plant for the most part being of well-known types. In the generator-house a set of Messrs. Humphreys and Glasgow's carburetted water-gas plant has been installed, with a capacity of 500,000 cubic feet a day; and the foundations have been put in for a duplicate set, when required. The mere mention of the name of the makers describes the plant sufficiently. In one corner of the house is the hydraulic lift for raising the coke-trolleys from the ground-level to the operating-floor, 15 feet above. The lift is 6 ft. 2 in. square. The peculiar character of the subsoil already described caused considerable difficulty in sinking the well for the ram. At 15 feet down, quicksand was encountered; and it repeatedly choked the pumps. Ultimately the trouble was overcome by sinking an old boiler-shell right through the 5 feet of quicksand to the peat; and then the work proceeded smoothly. It was noticed that the lift is protected the full height to the operating-floor by a strong wire-mesh guard, which has something of the appearance of basket work. This possesses the double advantage of protecting the men, and keeping the operations of the lift within view. Passing into the engine-house, the usual plant appertaining to a water-gas installation is found. A Sturtevant blower is used, driven by a Westinghouse engine. The various circulating and oil pumps, and an exhauster of the Gwynne make, are seen. The station meter which was formerly used in connection with the coal-gas plant has been removed for duty in this house; and at the back of it a photometer room has been arranged. A pump has also been installed for the purpose of raising the hydraulic ram in the generator-house from the level of the coke-yard to the operating-floor—a saving being effected here again by utilizing water from the adjacent river.

Coming to the boiler-house, Mr. Pooley mentioned that it was erected some time after the adjoining water-gas buildings. It contains two of Galloway's most recent type of boilers, 24 feet long by 7 feet diameter, with 28 cross tubes in each; and space is left, with foundations already in, for a third boiler, which can (if required) be of 8 feet diameter. It was observed that a Lowcock economizer is fixed at the back of the building, by means of which the feed-water can be raised in temperature to above the boiling-point before entering the boilers. The boiler-feed is by two injectors, injecting through the economizer, in addition to which (in case of emergency) the boilers can be fed by one of the pumps in the engine-house. The equipment includes both a hot and cold well. Gas-works breeze only is used as fuel; and there is a substantial quantity left, which is generously handed over to the electric light works. The foundations for the boilers are, like those of the building itself, very carefully piled.

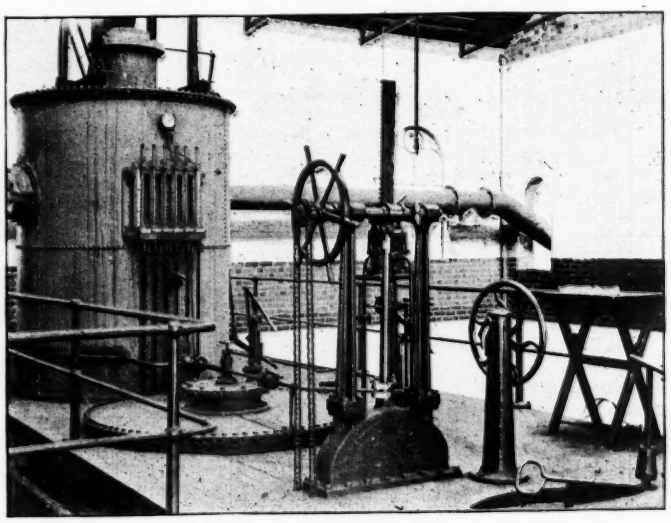


Fig. 4.—Operating Floor of the Carburetted Water-Gas Plant.

As to the other parts of the water-gas plant, the tar-separator is, of course, of Humphreys and Glasgow's type, and is built in blue brick, set in cement. The two oil-tanks have a capacity of 200 tons each; and the relief gasholder, of 35,000 cubic feet. Both the gasholder and the oil-storage tanks were built by Messrs. C. & W. Walker, acting as Sub-Contractors for Messrs. Humphreys and Glasgow.

The sulphate of ammonia house and store (fig. 3), which finish the range of new buildings, come next under notice. The store (which is on the side of the house away from the river) is covered by an old tar and liquor tank, measuring 20 ft. by 32 ft. by 5 ft. deep. The sulphate plant is one of Messrs. C. & W. Walker's latest types, and includes free and fixed stills, superheater, lime-mixing pots, and a pump for sending the devil liquor back to the free still, and for pumping the effluent to the retort-house, where it is used for the quenching of coke. The satuator was built by Messrs. Joseph Taylor and Co., of Bolton, and is made of ¾-inch solid lead plate. The condenser (outside the house) is composed of a set of horizontal pipes, with water-sprinkling arrangements. The purifiers are brick built, and are situated at the back of the house. The walls of the purifiers, it is of interest to note, are made hollow; the space being filled up with pitch to render them absolutely gas-tight. [It is, by the way, good testimony to the efficiency of the plant and working, when Mr. Pooley is able to say that he is taking the ammonia out of his liquor down to 0·001 per cent. The average is about 0·003 per cent.—certainly not higher than 0·005 per cent.] The sulphate-store is built of blue bricks, set in cement; and for a height of 8 feet, it is lined with lead sheets, which are supported by being built into the brick-work. The capacity of the plant is about 2 tons of sulphate per

24 hours; and the present make totals to about 170 tons a year. The house is so arranged that a second plant can be erected if at any time it is required; but this is contemplating something which must be further ahead than need occasion any serious thought at present.

Returning through the old portion of the works *en route* to another extension and improvement, evidences are seen here and there of the serious effect that the boggy nature of the ground has had on one or two of the buildings. It will be remembered that some years ago No. 2 holder was converted to Pease's wire-rope system of guiding, as the former framing was continually getting defective through the sinking of the ground, and the consequent settling of the tank. It is of interest to learn that the holder continues to work satisfactorily, and gives no trouble, though ominous-looking cracks in the ground in the neighbourhood cause Mr. Pooley to keep a sharp eye on it. However, to continue with the extensions, not far from this holder, and just to the south-west of the offices by the main entrance to the works, formerly stood the old meter-house, which was a single storey building, containing a meter, governor, and carburettor. The meter broke down soon after Mr. Pooley's arrival at Stafford; and it was therefore determined to erect the meter which was intended for the water-gas plant immediately outside the then existing meter-house, and to use the old one for the water gas. After the erection of the new meter, a house was built round it (fig. 6)—the old building forming an annexe to the new one. While this work was going on, advantage was taken of the opportunity to extend the offices—including a laboratory and store-room—by building above the old meter-house. Going inside the house, it is seen that a Cowan governor has been erected on the spot formerly occupied by the old station meter; and between this and the old governor (one of the Gas-Meter Company's make) is found a new carburettor, the patented invention of Mr. Pooley and Mr. Poulson, the Works Foreman. The new meter is of the Cowan type, with 15-inch connections, and of a capacity of 50,000 cubic feet per hour.

A few words as to the building itself. Here is found the only sound foundation on the whole works—being composed in this position of a fine shingle. The walls are of Colwich common brick; and the arches of Ruabon pressed brick. The sills and lintels are of concrete, made, as in the case of the other buildings, on the works. Mr. Pooley believes that buildings on gas-works in which plant of this character is housed can be relieved of dullness and made attractive at an expense little, if any, more than an ordinary featureless structure; and he proves it in the case of this house. The neat and ornamental character of the entrance is shown in fig. 5; and fig. 6 will give an indication (though it does not impart much idea of what the real thing is like) of the beauty of the interior decoration, which was carried out at a trifling expense above what ordinary lath and plaster walls would have cost. The ceilings of both the meter-house and the annexe are of pitch pine, that of the latter being (as seen) ribbed and panelled. The walls are covered with light-tinted glazed tiles, with a dark dado, and borderings of fancy design. The tiles were supplied by Messrs. Maw and Co., of Jackfield, Salop. The combination makes a very pretty effect indeed; and the cost, Mr. Pooley says, works out to only little more than what he estimated plastering would cost, besides which there will be no question of periodical painting or colouring of the walls. The floors are laid with plain red 6 in. by 2 in. tiles, herring-boned, with iron gratings as required to obtain access to the pipes.

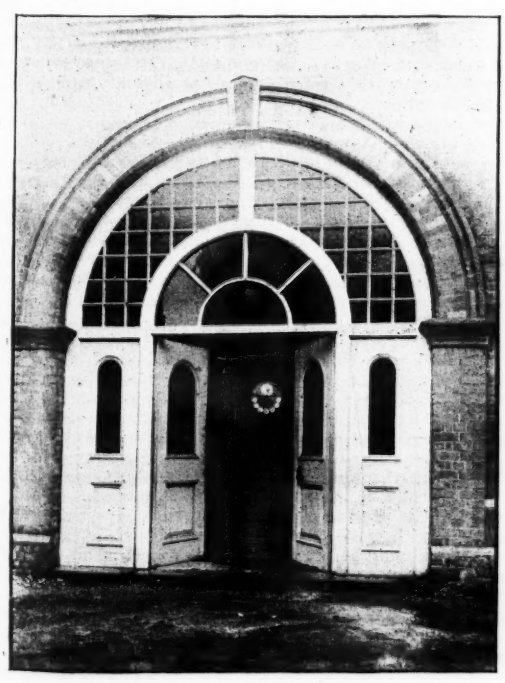


FIG. 5.—ENTRANCE TO THE METER-HOUSE.

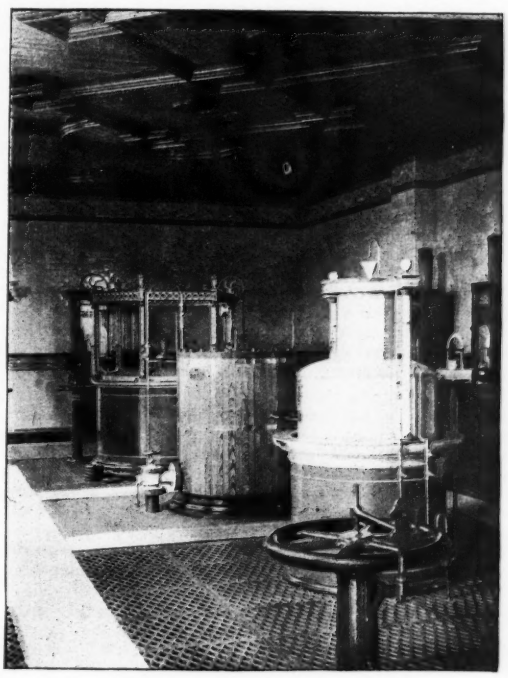


FIG. 6.—INTERIOR OF THE GOVERNOR AND METER-HOUSE.

The foregoing describes the extensions which have been made under Mr. Pooley's engineership. They are, as will have been seen, of an important character. But they do not exhaust the whole of the work that has been undertaken during the past three years. A considerable amount has been carried out in the retort-house in the way of renewals. Mr. Bell's settings have been adhered to. They are in beds of nines, 20 feet through, built up in 3 feet sections; the object of this being to assist in dealing with sinkings due to the underlying bog. Since Mr. Pooley's arrival at Stafford, all the beds have been out; and at the present time renewals are in progress. In the cellar of the house, the floor (which was formerly merely clay) has been covered with a good concrete surface. This has been down about twelve months, and is standing the heat well. In addition to these renovations and improvements, about three-quarters of an acre of the ground in front of the new buildings at the north end of the works has been levelled and asphalted, for a coal or coke ground, according to the necessities of the time.

From this account of the changes at Stafford the last few years, it will be seen that the works are being maintained at a high level of productive efficiency by Mr. Pooley, who has had every encouragement from his Chairman (Alderman C. H. Wright, J.P.) and the other members of the Gas and Electricity Committee. Were it not for the signs of structural disturbance here and there on the works, owing to the sinking movements of the bog, everything now would be, excepting in one or two small particulars, in excellent condition. At the same time, both the Committee and their Engineer are to be heartily congratulated on the completion of the new extensions, and the position that these place the undertaking in—particularly in relation to the demand for gas. The work has been well done throughout.

Coal Tar Colours for Dyeing Leather.—At the first meeting for the present session of the Nottingham Section of the Society of Chemical Industry, held on the 23rd ult., at University College in the town, Mr. M. C. Lamb read a paper on the subject of the fastness to light of leather dyed with coal tar colours in mixture. Pieces of sumach tanned leather were dyed with various mixtures of colours, the fading periods of which had been previously determined. It was found in every case that the time required for the fading of a leather dyed with a mixture of colours, the fading periods of which were equal, was the same as for either of the colours separately. Leather was dyed with a mixture of a very fast and a very fugitive colour. On exposure, the latter faded exactly as when applied to the leather singly; the former remained. Patterns of leather were dyed with numerous acid dyestuffs with the addition of formic acid; the fading periods were the same as when sulphuric acid was used. The fading period of leather dyed with basic colours and an addition of formaldehyde was found to be identical with that of fading when no such addition had been made.

PERSONAL.

After a service of more than fifty years, Mr. T. F. ALLISON has resigned the secretaryship of the Louth Gas Company, and been succeeded by his son, Mr. PHILIP ALLISON.

Mr. JOHN W. FIELD was on Thursday evening entertained at a complimentary dinner at the Princes' Restaurant by the Directors of the Gaslight and Coke Company, chief officers, and officials. A report of the proceedings appears on p. 298.

At a recent meeting of the Directors of the Farnworth and Kearsley Gas Company, the resignation of Mr. THOMAS LEA SHEPPARD as Manager of the Company's works was accepted. He has held the position for the past 27 years; and the works have largely increased since he undertook their management. A resolution was passed expressing the sympathy of the Board with Mr. Sheppard, and their appreciation of his past services, accompanied by a wish that rest might result in restoration to a better state of health. A retiring allowance was also granted to him.

In recognition of his services as Manager of the Spalding Gas-Works from 1891 to Aug. 31 last, when he resigned the position on being appointed Manager of the Wisbech Gas and Water Works, Mr. J. G. HAWKINS was last Wednesday presented with a testimonial subscribed for by members of the Spalding Urban District Council and many personal friends in the town. It consisted of a solid silver epergne, with large cut-glass dishes, and was accompanied by an illuminated list of the subscribers. The presentation was made at a complimentary dinner at the White Hart Hotel, when several of the Gas Managers in the Eastern Counties were among the company. Mr. G. Hall, the Chairman of the District Council, presided, and in asking Mr. Hawkins to accept the gift, remarked that when he came to Spalding, in 1891, he found gas-works of third-rate power, and he left them of first-rate power; so that the town possessed works which were equal to those of any place of equal population in the country. It was only in justice to him, therefore, that they should give him some memento of his residence in the "Metropolis of the Fens." On rising to respond, Mr. Hawkins was very cordially received. He expressed his sincere thanks, not only for the beautiful present he had received, but for the kind words by which it was accompanied. He said that during his residence at Spalding he did the best he could in his private not less than in his official capacity; and he should look upon the testimonial as marking twelve years of the happiest time of his life.

OBITUARY.

The death is announced of Mr. HENRY WILLIAM PEARSON, M.Inst.C.E., the Resident Engineer of the Bristol Water Company. Deceased, who was about 57 years of age, was appointed an assistant in the Engineer's office in 1872, and two years later he was promoted to the position he held at the time of his death. Mr. Pearson was a member of the Institution of Mechanical Engineers, was on the Council of the Association of Water-Works Engineers, and was a Fellow of the Geological Society.

In another part of the "JOURNAL" will be found a brief account of the fatal accident to Mr. WILLIAM JONES, the Manager of the Dalton-in-Furness Gas-Works, on Monday last week. Mr. Jones, who had held for nearly 37 years the position he filled at the time of his death, was a native of Abergele, in North Wales, and his first connection with gas making was as under-stoker at the Saltaire Gas-Works; and he was afterwards employed in a similar capacity at Fleetwood. From there he removed to Barrow, to take charge of the Furness Railway Company's gas plant. In 1866, however, he was approached with the view of his managing the Dalton Gas-Works; and he accepted the offer. At that time, the price charged was 8s. 6d. per 1000 cubic feet; but he succeeded in bringing it down to 2s. 6d. Mr. Jones joined the British Association of Gas Managers in 1874; but his membership of the Gas Institute lapsed in 1896.

We regret to learn, from the "Journal für Gasbeleuchtung," of the death, on the 10th ult., almost at the close of his 92nd year, of Herr RUDOLF OLDENBOURG, the founder and head of the well-known book-selling firm of R. Oldenbourg, of Munich and Berlin. His decease severs a literary connection with the gas industry extending over nearly half-a-century, inasmuch as 45 years ago he recognized the need of a publication to represent the industry in Germany, and, at the suggestion of his friends Pettenkoffer, Liebig, and Knapp, he associated himself with Dr. Schilling in starting the above-named publication, which was the first German technical trade journal. His relations with many eminent men in the domain of science and art afforded scope for the exercise of his characteristic energy and enterprise; and the large business which bears his name was the outcome of their combined labours. Commercial success, however, was not his sole aim. He had at heart the advancement of German science; and he gathered round him a group of men who willingly supported him in his work. Apart from his business capabilities, he was endowed with a personality which attracted to him a large circle of friends, who will cherish his memory, and who deeply sympathize with the family in the loss they have sustained.

COMMUNICATED ARTICLE.

THE ARRAIGNMENT OF GAS REFEREEISM.

By C. E. JONES, Assoc.M.Inst.C.E., of Leyton.

(*Continued from page* 211.)

Prohibition of Sulphuretted Hydrogen.—The presence of sulphuretted hydrogen was prohibited, under a penalty of £50 for every offence, by the Metropolis Gas Act, 1860. For the detection of this impurity, the Board of Referees have prescribed tests much more stringent and delicate than were formerly used—said to be too refined for a commercial degree of purity; and to insist on "chemical purity" is straining the law. This point may be considered later on. However, it is for the Commission, if the point is a reasonable one, and the necessity absolute, to afford relief. In the chemical field of sulphur purification, knowledge, the outcome of experience, has advanced; and the progress has probably been accelerated by the official expedients of the Board. But the average number of grains remain as before. The nature of these sulphur compounds, and the action of reagents upon them, is much better understood now than formerly, with the result that a diminished number of grains are allowed in summer; and it was fondly anticipated that their total elimination would be effected. If the Companies' opposition is successful, the hope is vain; and a trace of sulphur will still flavour London's gas. At first sight, this is retrogression; nevertheless, there is much to be said in its favour, since to overdo the purification hobby is both possible and disadvantageous. It is only another instance of theory conceding a point to practice. However, it is sufficient to mention in this place that many gas engineers consider most of the advantages enumerated above as too dearly purchased. What is required, if London gas is to fulfil its illimitable, industrial, and economic mission, is a free hand, less legislative coddling, and abolition of academic and harassing restrictions enforced by the Gas Referees, and from which all the rest of the kingdom is exempt.

The *bête noire* of sulphur purification is almost unknown in the Provinces, especially in works under municipal management, where, as a rule, no serious attempt is made to remove such sulphur compounds as are detectable only by analytical demonstration of the products of combustion of coal gas; consumers being content with the elimination only of the sulphuretted hydrogen, the ammonia, and the ordinary impurities. Extended experience furnishes convincing proof of the ordinary consumer's indifference to the presence or otherwise of bisulphide of carbon; and, if his gas be low in price, he will even tolerate 40 grains of sulphur per 100 cubic feet, without a murmur. Any attempt to impose the Metropolitan system upon municipal undertakings would be strenuously, and without doubt successfully, opposed by these authorities. It is indigitatively asked, if Birmingham, Bradford, Manchester, Nottingham, Leeds, and 250 more industrial and social centres owning gas-works, ignore sulphur purification, why it should be enjoined in the Metropolis, where most gas-works, by the nature of their environment, are without reasonable facilities for its adoption. These considerations, and some others of equal weight, will doubtless be advanced by the Companies, and the official rejoinder of the Referees cannot fail to excite widespread interest wherever gas manufacture is intelligently carried on, at home or abroad.

In the meantime, it may not be energy wasted if we discuss, more or less technically, the purification of coal gas, and endeavour to ascertain the advantages of eliminating carbon disulphide, and the injurious effects of the combustion of sulphur in atmospheric air. In pursuing this inquiry, it is almost impossible to avoid traversing old ground, or perhaps to say anything new; but probably adolescent readers will find something to interest them, even if the aldermen of the profession should not. Those familiar with the subject—and there are some painfully so—are recommended by the writer to pass on to a more readable page of the present issue of the "JOURNAL," lucubratory productions being of small account or non-appreciable.

Sulphur in Coal.—This mineral, being of undoubted vegetable origin, the presence of minute portions of sulphur, due to absorption during plant life, is easily accounted for without taking into consideration any extraneous sources of lithological impurity, such as would occur in lacustrine or fluviatile waters charged with sedimentary deposits of mineral substances during or before the inundation, actual submergence, and subsequent consolidation of vast, dense, luxuriant masses of forestal vegetation. It is, however, from these sources, rather than from the plant itself, that the bulk of the sulphurous compounds is derived. And hence the amount of sulphur associated by interstratification and other means with coal is of immense importance to the manufacturer of coal gas, since it assumes such undue, unequal, and arbitrary proportions as to render some coals unsuited to his purposes—the expense involved in removing the impurities being excessive and avoidable.

By the reader's pardon, and the Editor's permission, this point may be digressively illustrated by an instructive case in the author's own experience. A certain Board of Directors—for some

reason locally understood, but publicly inexplainable—determined on the purchase of a supply of known sulphurous coal, which we will designate "B," at 4d. per ton less than a coal of good repute (say, "C") was tendered. In spite of all care in extracting, picking, and handling the pyritaceous matter inclosed in "B," its cost, by lime purification, amounted to 11·84d. per ton, instead of an average of 3·60d. Far from effecting a fanciful board-room saving by a stroke of the pen of 4d. per ton, and apart from other points of inferiority, "B" was dearer than "C," in purification alone, by more than the reputed saving. Thus 11·84d. – 3·6d. = 8·24d. – 4d. = 4·24d. loss per ton. Other cases may be cited; but as comparisons are odious, *verbum sap.*

There is scarcely a seam of coal in the measures approaching uniformity in quality throughout; and pyritic impurities will vary in the same seam, rendering portions of it unsuitable for gas-works. Analyses of dry coals (usually picked samples) by gas engineers, including the writer, show the proportions of sulphur to vary considerably. In a few samples, traces only could be detected; but disregarding these, and speaking generally, it can be safely affirmed that all gas coal contains sulphur in a greater or less degree. This is shown at a glance in the table which is below; and it may be assumed that the samples were the best of their kind.

Locality of Collieries.	Sulphur in Sample.	
	Highest.	Lowest.
	Per Cent.	Per Cent.
Forest of Dean	4·10	0·85
Derbyshire	4·00	0·84
South Wales.	3·95	0·79
Somersetshire	3·10	0·69
Scotland	2·44	0·32
Lancashire	2·43	0·80
Staffordshire	1·50	0 80
Yorkshire	1·40	0·63
Durham	1 32	0 06
Mean of highest and lowest	2·69	0·64

Samples of coals from France, Japan, America, and New South Wales, and subjected to analysis in this country exhibit similar variations in sulphur, and general agreement in other characteristic features—leaving no doubt as to the flora of the coal formation being identical in all fields at the same epoch, with a general coincidence of geological phenomena and climatological conditions. The agencies of high heat, vapours, mists, humidity, rain, wind, storms, and tempests produce results in most, if not all, respects of concordant similarity.

Combining Properties of Sulphur.—Brief allusion has been made to the allotropic and other properties of sulphur; and we must now notice its almost limitless capacity for metallic combination at ordinary or higher temperatures, as illustrated by the sulphide series of ores, as galena (PbS), blend (ZnS), cinnabar (HgS), and antimony (SbS_3). It combines with calcium as sulphide (CaS), bisulphide (CaS_2), and penta-sulphide (CaS_5). As sulphate of lime (SO_4Ca) in combination with water, it is met with in Nature as selenite, alabaster, and gypsum. It is, however, in its combination with iron—as ferrous or monosulphide (F_2S) and bisulphide (FeS_2) associated with coal—that we are most concerned. The latter compound is an abundant natural product occurring in rocks of all ages. It forms the yellow, brassy compound known as iron pyrites, often found in cubiform crystals. Sulphur also forms combinations with cyanogen (C_2N) and ammonia (NH_3), which play their part in gaseous science.

Destructive Distillation.—Without following in detail the intricate and interesting process of coal distillation known to chemists as "destructive"—though, as a matter of fact, nothing is destroyed—slight reference seems necessary; and to observe that the complex operation is considered one of the most important applications of the principle, and its marvellous tendency to form new chemical compounds, is certainly not the least. It is established that, in the constitutional structure of coal, these various and complex substances do not exist as such, and are not entitled to be considered eductive extracts. They are assuredly the productive results of applied heat; and, consequently, they are new synthetic creations or true chemical products. 'Tis passing strange, yet too true, how our familiarity with this admirable process, and indecent haste to pecuniarily profit by it, obscures its latent beauties, darkens its operations, and breeds that contempt for chemical wonders which in Sanskrit, Aryan, or other ancient literature is reserved for baser objects! "Oh pray you tarry; pause and think of each thing well!"

Five or six elemental forms of matter in different proportions, or diverse forms of arrangement, are capable, by chemical action and reaction, of producing, and do produce accordingly, a multitude of serviceable, gaseous, liquid, solid, acid, and alkaline compounds—many unknown, unseen, unrevealed to man before; and the distillate exceeds in its cubic contents more than 700 times the original solid charge! The transmutation is complete; the witchery done! Occult science stands disclosed, open, her secrets laid bare, her auriferous achievements extend far beyond the wildest dreams of ancient, haggard, and withal enthusiastic, alchemic students. Surely the embroidered turban, magian mantle, and mystic wand of pharaonic magicians have suffered a transference; and, *presto* change, they now adorn the modern conjurer, or black wizard, who dwells in a palace of enchantment—yclept the gas-works. By the exercise of his white magic or superior pyronetic knowledge of the powers of Nature, he converts the world's primary forests into chemical combinations, "airy nothings," which henceforth take their place in the sum of the world's servants, and claim, and are given, "a local habitation and a name!"

Sulphuretted Hydrogen and Other Sulphur Compounds.—In this brief memoir, we are chiefly concerned in following sulphur through its metamorphic journey from imprisonment in the carboniferous rocks countless ages ago (when the earth was infantile, young, and being prepared for man's occupancy) to its combustion as a constituent of coal gas—an industry begun a hundred years ago; a period whose duration, compared to geological time, is less than the tick of a clock. Sulphur is the most troublesome substance with which the London gas-maker has to deal; and although the quantity of the compound is inconsiderable, its capacity for combination with other bodies enables it to present itself in several forms, some of which defy isolation. Eminent chemists have failed to analyze them proximately; and even such a capable body of scientists as the Gas Referees have been unable to determine their ultimate composition, or even to affirm to what class they belong, or what series of compounds constitute this impurity. It is hard to believe that chemical science will not ultimately secure this illusive substance. But beyond allowing its presence to be known as a product of combustion, residual sulphur persistently remains in the purified gas; and its chemical composition remains as enigmatical as ever.

Sulphuretted Hydrogen.—Hydrogen combined with 2 atoms of sulphur constitutes the evil-smelling compound before mentioned. By law, under a penalty of £50 for each offence, the presence of sulphuretted hydrogen is prohibited; and inasmuch as its removal offers no considerable difficulty, it need not detain us very long. Hydrated oxide of lime removes the gas easily, as also carbonic acid gas; and lime is unquestionably the best all-round material to use for the purpose. But when foul, its careless removal (which is also expensive) creates a nuisance, which is an offence under the Public Health Acts; and in large centres of population its use assures the companies unpopularity, and likewise renders them liable to an action at law. Advantage is therefore taken of the active affinity of sulphur for iron; and a suitable oxide of that metal which is capable of revivification (which lime is not) is employed—the sulphur being afterwards recovered. The material may be used over and over again till the presence of sulphur renders it inert. In testing for this gas, a salt of lead is employed, usually the acetate, which is a most delicate test. The sulphur combines with the lead, forming a sulphide which is black, or, if the gas is but present as a trace, the compound is brown in colour. Any discoloration of the test-paper, however slight, is conclusive evidence of the presence of this impurity; and the usual punishment follows.

Bisulphide of Carbon.—After the elimination of sulphuretted hydrogen, there remain usually some 40 to 50 grains of sulphur in other forms than sulphuretted hydrogen in every 100 cubic feet of the purified gas. Probably 30 to 40 grains of this is sulphur combined with carbon, as bisulphide of carbon—an important and interesting compound which has been the means of creating the honourable Board of Gas Referees. But for the objectionable presence of this substance, and a desire to remove it together with unknown sulphur compounds which continue to defy isolatory efforts, it is morally certain that other means than Refereeism would have been adopted to regulate and circumscribe the powers and doings of the wicked Metropolitan Gas Companies. Thus this sulphur evil exists that grace may abound. Although ranked as an "impurity" in London gas, it is not so considered in the Provinces, where its presence is practically ignored. A brief consideration of the properties of this most useful compound may not be out of place.

Bisulphide of Carbon.—This is easily prepared by passing sulphur vapour over charcoal heated to redness. In a gas-retort with the charge burning off, we have these conditions, only our carbon is in the form of coke instead of charcoal. It is prepared on a large scale by passing the vapour of sulphur over glowing coke, and condensing in suitable apparatus. The operation is remarkable; being one of the few compounds of carbon obtained by the direct union of their elements. Bisulphide of carbon combines with the sulphides of the alkaline metals, forming compounds distinguished by unstability, resembling the carbonates; but they contain sulphur instead of oxygen. Example: Potassium carbonate K_2CO_3; the corresponding sulphocarbonate being thus represented K_2CS_3.

In the Arts, bisulphide of carbon is of considerable service as a solvent for phosphorus, sulphur, iodine, bromine, and caoutchouc. India-rubber tubes, therefore, are not the best material to use for conveying coal gas. It dissolves fatty matters, and extracts the essential oils of perfumes. Being a diathermanous body, it arrests the luminous rays, but allows calorific rays to pass. In spectrum analysis and other optical experiments, its high refractive and dispersive powers are much valued. It boils at 48° C. (118·5° Fahr.), and is vaporized at ordinary temperatures. Like sulphuretted hydrogen, it acts injuriously if breathed for any length of time; and its poisonous properties are utilized for killing insects in grain without injuring the cereal. It is exceedingly inflammable, taking fire at a temperature which fails to ignite

ordinary combustible gaseous bodies. It burns with a bright blue flame, producing carbonic and sulphurous acids thus—$CS_2 + O_6 = CO_2 + 2SO_2$; and unless the air supply is abundant, deposition of sulphur is certain to take place. The great inflammability of bisulphide of carbon is, in the author's opinion, of extreme importance in explosive mixtures such as are used in gas-motors, as its presence ensures the firing of the mixture. A red-hot iron will be found incapable of igniting an explosive mixture of coal gas and oxygen. Should, however, a trace of bisulphide of carbon be present, it explodes readily.

Bisulphide of carbon, unmixed and pure, takes fire at (say) 300° Fahr. When mixed with gases, a higher temperature than this is requisite to cause ignition. It then becomes the heat carrier to the whole mass; the temperature of its combustion being the secondary cause of explosion.

On these grounds, its entire removal from coal gas is by no means a *desideratum*, inasmuch as the temperature or ignition point of coal gas would be raised, and its usefulness impaired for motor purposes. It may be that benzol vapour and bisulphide act mutually in this respect; and the point is worthy of physical and chemical determination before compelling our engineers to eliminate all sulphur compounds from coal gas. Mysterious explosions from sparks from workmen's tools may possibly be traceable to this theory, as also the concussion of falling bodies into gasholders firing the gas, such as guide-framing collapsing—an argument, by the way, in favour of columnless or spirally guided gasholders, and the total abolition of the costly, hideous, guide-framing. Such, then, is the body which called into existence a triarchy armed with sovereign powers for its suppression; and up to date it has steadfastly refused to become amenable to the process, but turns up as merrily as ever, from time to time, at the point of combustion.

The Practical Elimination of Bisulphide of Carbon.—Several processes have been tried, with more or less success, for the removal of this most interesting compound; but no cheap, convenient, and efficient means have yet been found to accomplish it. Strong ammoniacal liquor which contains hydrosulphate of ammonia is a good absorbent. Superheated steam will convert the compound into carbonic and hydrosulphuric acids—both easily removable from the gas. Lime, at a red heat, acts similarly; and oxide of lead and caustic soda have been used—the sulphur combining with the metal to form a sulphide. The soda process awaits development. Alcoholic solutions of potash and soda are capable of absorbing even the sulphocarbonates; but the material found to be efficient and reasonable in price is lime, which is converted by the sulphuretted hydrogen in the foul gas into sulphide of calcium, for which bisulphide of carbon has great chemical affinity. The efficiency of this process is undoubted, but is likely to be impaired or rendered ineffectual by the presence of carbonic acid gas, which, by displacing the bisulphide, renders the second state of things worse than the first. It is, however, capable of being manipulated so as to ensure the removal of bisulphide of carbon without rushing up the sulphur in the purified gas—an event generously admitted into the category of "unavoidable causes or accidents."

One militant disadvantage of the employment of lime is the fœtid effluvia which emanates from the fully-charged or spent material, the removal of which is both difficult and expensive, and in populous neighbourhoods strenuously opposed as a nuisance and danger to public health; and companies are liable to heavy mulctuary proceedings if they create manufacturing nuisances. The Gas Referees are empowered to ascertain that the Companies take all reasonable means for preventing nuisance in the various processes carried on in the manufacture and supply of gas; and they recognize the difficulties surrounding the situation by permitting a maximum amount of "sulphur in other forms than sulphuretted hydrogen" of 22 grains per 100 cubic feet for the six months of greater supply, and a maximum of 17 grains for the six months of lesser supply. In other words, 5 grains less in the summer, or period of least consumption, and 5 grains extra during the six months of maximum consumption. This inconsistent regulation is owing to the inadequate means at the Companies' command to deal with greater efficiency with the larger volume of gas. The mean or average amount of sulphur allowed in London gas is, therefore (say), 20 grains. As a matter of fact, it contains less. In the Provinces, with facilities for the unrestricted use of lime in its requisite forms, reducing the sulphur to this amount presents no difficulty; but in the Metropolis it is said to be most difficult, and, having regard to the facts of the case, totally unnecessary.

As already mentioned, this is one of the contentious points to be settled by the Commission, after taking evidence; but as a matter of the degree of chemical purity actually attainable, 20 grains is a liberal prescription, as the following attested record demonstrates: Twenty-six years or more ago, the writer reduced the sulphur in the gas supplied to Chesterfield and district to less than 10 grains per 100 cubic feet. It is often said, and usually accepted, that 7 to 8 grains of sulphur compounds are irremovable by the use of lime; but this assertion is not supported by the experience of the author, who has frequently reduced the residual sulphur to such infinitesimal quantities as 4 and 3 grains respectively per 100 cubic feet. The following letter from the late Dr. Pole to the author on this subject is now published for the first time. At the time of Dr. Pole's visit, which was a surprise one, no ammonia was detected in the purified gas. Here, again, the 4 grains of ammonia prescribed by the Referees cannot be considered a hardship.

THE METROPOLITAN GAS REFEREES.

17, *Buckingham Street, Adelphi, W.C.*,
Aug. 1, 1877.

Dear Sir,—I have pleasure in certifying, if it is any satisfaction to you, that on the 31st of July I tested the gas supplied by your Company, with Mr. Vernon Harcourt's sulphur test, and found it to contain only 10 grains of sulphur per 100 cubic feet of gas.

This is only half the quantity we allow in the London gas, and is a degree of purity which, in the present state of knowledge, may be considered very satisfactory.—Faithfully yours,

WILLIAM POLE, F.R.S.,
Civil Engineer
(One of the Metropolitan Gas Referees.)

Charles E. Jones, Esq.,
Gas-Works, Chesterfield.

It is, therefore, indisputable that the gas formerly supplied at Chesterfield was of great chemical purity, second to none in the Kingdom; the sulphur compounds being nearly all eliminated. Naturally, it will be asked, Did the consumers appreciate such an unusual and high degree of purity? Possibly; but there was no outward manifestation of pleasure observable—no special sign of contentment at the Engineer's very satisfactory achievement was noticeable. True, the Company were under no statutory obligation to remove from the gas any sulphur compounds other than sulphuretted hydrogen. The extra service was therefore entirely gratuitous; so the usual result followed—the Company got no thanks, and the poor Engineer went unrewarded. "That sin of upstarts," as the ostracized Themistocles calls ingratitude, prospered here, as at Athens 2300 years ago; but the object lesson remains. A reduction in the selling price was of far more interest to the consumer than infinitesimal proportions of bisulphide of carbon; but the Board of Directors was obdurate, and have since ceased to exist, therefore *requiescat in pace*. Consumers are alike everywhere, and, given cheap gas, care nothing about 30 or 40 grains of sulphur in the purified article. And London is no exception to the rule. Had the sulphur compounds never rewarded chemical research, coal gas would have been more popular, cheaper, and more extensively used than at present in the Metropolitan district. The sulphur scare retarded the progress of the industry, and hampered the work of the gas engineer. Now is the accepted time and season to remove his fetters, "and let him soar away."

(To be continued.)

The working of coal in the United Kingdom still shows progress; but the advance in its production has proceeded of late years at a slackened rate. In 1893, the output was 164,325,795 tons, valued at £55,809,808. Last year the figures were 227,095,042 tons, of the value of £93,521,407. In 1900, the output was about 2 million tons less than 1902, but the value was £121,653,596; the next year the tonnage was about 8 millions less than last year, while the value was £102,486,552.

We learn from the "Builder" that one of the most complete series of investigations carried out in regard to the permeability of concrete was that undertaken by M. Feret, in the laboratory of the Ponts et Chaussés, which occupied five years. It appears therefrom that the porosity of cement mortar varies considerably; diminishing as the proportion of cement increases, and increasing as the size of the sand grains diminishes. The permeability of mortar diminishes as the proportion of cement increases, but increases with the size of the sand grains. It will thus be seen that the conditions of permeability and porosity are by no means alike. The further difference is apparent that, while all mortars immersed in water will absorb liquid of volume practically equal to that of the calculated voids, there is a very great difference as regards their permeability; and in general it seems that the most porous mortar is the least permeable, and *vice versâ*. According to M. Feret, the effect of the passage of water is to set free small particles of cement, bringing them to the surface, where they produce fine stalactites tending to solidify the mortar, and form an exterior coating.

At the recent convention of the Verein Deutscher Ingenieure, Dr. Ostwald delivered an address upon the relations which exist, or should exist, between the professions of engineering and chemistry. He dwelt specially upon the importance of the use of the principles of theoretical chemistry in the design of gas-producers for various fuels. He pointed out that in this way it is possible to use the low-grade brown coals and lignites, or even peat, as a cheap fuel, producing gas suitable for application in the most efficient manner in large gas-engines similar to those designed for the utilization of blast-furnace gases. He went on to remark that the technical applications of water gas are also of great importance, both in connection with illumination and as a fuel for power and metallurgical purposes; and he showed that vast improvements in its efficient generation have resulted from the application of correct chemical principles to practical processes. With all of these came the associated operations for the recovery of valuable bye-products, some of which often rank in commercial value nearly with the principal product. All these elements unite, in his opinion, to make the establishment of central gas-producing stations most essential for the attainment of the highest commercial efficiency.

TECHNICAL RECORD.

PROFESSOR SMITHELLS ON THE BUNSEN BURNER.

A Sketch of an Interesting Lecture, Recording the Results of Important Experimental Work.

The newly-formed Yorkshire Junior Gas Association were highly fortunate and honoured at their Inaugural Meeting at Leeds on Saturday. Not only did the authorities of Yorkshire College give them encouragement by placing their library and lecture-room at their disposal, but Professor Arthur Smithells, F.R.S., gave them a lecture which will not only attract attention to this latest of gas organizations, but which possesses within itself facts, suggestion, and thought which should be diffused throughout the gas profession, and by its members among the greater class of users of the Bunsen flame—the ordinary consumers of gas. Professor Smithells is pleased to call his lecture "a modest affair;" it was a clear exposition of many of the problems involved in the Bunsen burner, and the methods by which they have been attacked. The delicate experimental demonstrations with which he illustrated his points could not have been performed by the lecturer with more painstaking exactitude even if he had been before the *savants* of Albemarle Street. The lecture was of a character—being so largely interspersed with experimental work—that lends itself better to description than to an actual record of the lecturer's own words. These introductory remarks should, however, not be closed without attention being directed to Professor Smithells' observations (reported on p. 292) at the inaugural dinner of the Association in the evening, in the course of which he gave expression to some luminous views on the general question of applied science and gas lighting.

On the members assembling in the lecture room of the College,

The PRESIDENT (Mr. W. Cranfield, of Halifax) said that Professor Smithells by repute needed no introduction to the members, even if personally, until that day, he had been unknown to them. They felt themselves particularly honoured that they were meeting as a Yorkshire Association in the Yorkshire College to listen to a lecture by such a distinguished Professor of Chemistry. Professor Smithells was by no means an outsider in matters connected with gas, though his connection with the gas industry had been more of friendship and research work than actual formal appointment. He was going to lecture to them on a subject that was peculiarly his own; and in the future as in the past—in the future even more than in the past—he would place the gas industry under a deep obligation to him.

THE LECTURE.

With the introductory remark that the Bunsen burner might be said to have had its foundation in an experiment of Sir Humphry Davy, Professor Smithells began his lecture by taking a "text" from the volume in which are collected Davy's own accounts of his researches from 1815 to 1828. The passages are worthy of being brought to mind, and therefore we reproduce them:—

> When a wire-gauze safe-lamp is made to burn in a very explosive mixture of coal gas and air, the light is feeble, and of a pale colour; whereas the flame of a current of coal gas burnt in the atmosphere, as is well known by the phenomena of the gas-lights, is extremely brilliant. In a paper read before the Royal Society, I have endeavoured to show that in all cases flame is a continued combustion of explosive mixtures. It becomes, therefore, a problem of some interest, Why the combustion of explosive mixtures, under different circumstances, should produce such different appearances? A very acute philosopher, who himself started the subject in conversation, suggested the idea that, in the combustion of explosive mixtures within the lamp, carbonic oxide might be formed; and that the light might be deficient, from the deficiency of the quantity of oxygen necessary to produce carbonic acid. On submitting this idea to the test of experiment, it was discovered to be unfounded; for, by the combustion in the wire-gauze lamp, carbonic acid was produced in quantities as great as could have been expected from the quantity of oxygen consumed; and, on adding oxygen to a mixture in quantities more than sufficient to burn the whole of the gas, the character of the light still continued the same.
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> In reflecting on the circumstances of the two species of combustion, I was led to imagine that the cause of the superiority of the light of the stream of coal gas might be owing to the decomposition of a part of the gas towards the interior of the flame where the air was in smallest quantity, and the deposition of solid charcoal, which, first by its ignition, and afterwards by its combustion, increased in a high degree the intensity of the light; and a few experiments soon convinced me that this was the true solution of the problem.
>
> I held a piece of wire gauze, of about 900 apertures to the square inch over a stream of coal gas issuing from a small pipe, and inflamed the gas above the wire gauze, which was almost in contact with the orifice of the pipe, when it burnt with its usual bright light. On raising the wire gauze so as to cause the gas to be mixed with more air before it inflamed, the light became feebler, and, at a certain distance, the flame assumed the precise character of that of an explosive mixture burning within the lamp. But though the light was so feeble in this last case, the heat was greater than when the light was much more vivid; and a piece of wire of platinum held in this feeble blue flame became instantly white hot.

With this appropriate introduction, Professor Smithells went on to say that, in 1855, appliances based upon this simple experiment of Davy were in use in England for producing non-luminous flames. In that year, Sir Henry Roscoe, going to Bunsen, who had just built his new laboratory in Heidelberg, showed these appliances to the great chemist. Bunsen was not satisfied with them, and set to work, in his usual simple and ingenious way, and constructed the burner that had ever since borne his name. He constructed the burner as a tool; and the science involved in it was not investigated for a long time. Eventually a pupil of Bunsen, named Blochmann, published the results of an elaborate investigation into the chemistry of the Bunsen burner. The results of these investigations were very valuable, and gave rise to a good deal of interest in the science of atmospheric burners. The value of Blochmann's results was diminished, however, by the fact that he used a highly complex combustible coal gas; and Professor Smithells does not find that even Blochmann realized the essential mechanical structure of the Bunsen flame. This was usually regarded, and is still frequently regarded, as a mass of non-luminous flame, with an inside surface and an outside surface; but Professor Smithells thinks that it is better to consider it as being essentially a double sheet of flame—consisting of an inner cone and an outer cone. That this is so, he demonstrated by a long Bunsen burner made of glass. With an increasing supply of air, the double coned structure became clearly apparent, so much so that one cone could be, and was, distinctly separated from the other. He then showed the same phenomenon by means of his own separator, consisting of an arrangement of two tubes, the particulars and principles of which, he mentioned, are described in his published papers. The Bunsen flame, the lecturer here remarked, must be regarded essentially as a flame in which the gas is burning partly with air admitted through the air-valve and partly in the free air of the surrounding atmosphere. A structure of this kind will be taken by the flames of all gaseous combustibles; and he illustrated this by burning carbon monoxide. A simple jet of carbon monoxide, when lighted, gives a simple cone of blue flame; and if air is admitted, part of the combustion takes place in the air, and an inner cone is at once developed. If the air supply is sufficiently increased, it suffices for the complete combustion of the gas, which then takes place in a single cone independently of the surrounding atmosphere.

Advancing to gases where the chemistry of combustion was more complex, Professor Smithells expounded how complications arise in the flame. He exhibited an experiment with cyanogen, showing the cleavage of its flame into two distinct parts, in the first of which the carbon was burnt to carbon monoxide, and in the second the carbon monoxide was burnt to carbon dioxide in the surrounding air. This led up to coal gas. The lecturer pointed out what a complex substance this is, and described the behaviour of a stream of coal gas as it issues into the air. Owing to the great variation in the diffusibility of the components, the gas remains no longer homogeneous when it enters into the air; the more diffusible constituents—the hydrogen and the marsh gas—move outwards, and the less diffusible, including the illuminating constituents, lag behind. He thinks that one of the chief merits of the system of inquiry which has been pursued in his laboratory is that there they have worked with simple gases—marsh gas, ethylene, pentane, benzene vapour, and such substances. He did not describe the details of these experiments, as they are already fully recorded; but he said that perhaps the most striking outcome of the investigations is the conclusion that, when coal gas is burned with insufficient oxygen or air for complete combustion, it is not the carbon which is left unoxidized but rather the hydrogen. This result is completely at variance with what was formerly the accepted doctrine. By means of a current of air charged with benzene vapour, Professor Smithells then showed how, by altering the proportions of air and vapour, transition can be obtained from the ordinary luminous flame to a double-coned flame; and, finally, when the air supply is sufficient, to a single-cone flame of pale blue colour, in which oxidation of the hydrocarbon was complete in one single simple shell.

Interest was then turned into a new channel, when Professor Smithells went on to speak of the conditions which affect the heating power of a Bunsen flame, and raised the question first as to whether the Bunsen flame is hotter than the ordinary luminous flame consuming the same amount of gas. He said that very vague ideas as a rule prevail on a subject of this kind; and the answer he usually obtains to a question on the point is that a Bunsen flame is the hotter. If he further asked, "Why?" the answer was, "Because there is more complete combustion." The last reply, he simply and decisively characterized as "nonsense;" but before expanding on the point, he referred to the question of the products of combustion. Neither the Bunsen flame burning freely in the air, nor a flame of a properly constructed burner giving a luminous flame, yields, he said, products of imperfect combustion to any appreciable degree. Erroneous ideas also prevail upon this question. People believed that the luminous flame gives smoke, and point to the darkening of ceilings. He, in turn, pointed to the darkened walls above hot-water pipes. The explanation is the same in the two cases. The black deposit is the deposit of dust caused by ascending currents of air carrying up atmospheric dust, and depositing it on cold objects.

Reverting the question of which is the hotter flame—the Bunsen or the ordinary luminous, Professor Smithells asked the pertinent questions: "How are you going to measure the temperature? Are you going to measure it by means of a thermometer, or something like a thermometer, or by means of a metal ball heated in the flame, and then plunged into water to see how much it will warm the water?" Obviously much depends upon the choice of instrument. The matter may be settled to some extent by reference to fundamental principles. It is a firmly established principle of science that the same amount of combustible material completely burned gives out an unalterable quantity of heat, whether the combustion takes a second or six months to perform. But it can be easily understood that so far as temperature is concerned, the matter is quite different—that the temperature attained during combustion depends not only on the total quantity of heat, but on the manner in which, so to speak, the heat is concentrated by confinement to a short space of time or to a small volume of space. Take an ordinary Bunsen burner and shut the air-holes, and compare the volume of the resulting luminous flame with the volume of the flame produced by the consumption of the same amount of gas when the air-holes are open. If the volume of the Bunsen flame is smaller than that of the luminous flame, then the general temperature of the region of flame must be higher. In this sense, it may be said that the Bunsen flame is hotter than the luminous flame. But it must be remembered that a flame must not be treated like a hot poker, and be regarded as a thing of uniform structure throughout. It is, as already seen, a thing composed of thin sheets; and if anyone wants to know the temperatures that reside locally in the flame, he must use a measuring instrument of suitable dimensions. There is no use in sticking a thermometer into a sheet of flame wholly insufficient to envelop its bulb, or to use any measuring instrument in that way. To measure the temperature of thin sheets of flame, very fine thermometric instruments must be employed. Professor Smithells called attention to this some years ago, by recording experiments in which he used very thin platinum wire. He found he could easily melt such a wire in the outer portion of an ordinary luminous flame, whereas he could not melt it in an ordinary Bunsen flame. This showed a temperature above the melting point of platinum —1775° C. In one sense, therefore, one might be inclined to say that the luminous flame is hotter than the non-luminous one. The moral of it all is that, when speaking of temperatures in connection with flame, what is meant must be very carefully specified. This view Professor Smithells enforced by passing a Le Chatelier thermo-couple through a flat luminous flame, connecting the thermo-couple to a galvanometer which threw a spot of light on to a screen. The great variations of temperature in the different sheets in the flame were clearly seen.

From this, Professor Smithells naturally dropped into the consideration of questions affecting the Bunsen burner for general heating, and its uses. The burner, he said, is a simple appliance, but it has its defects and ailments—mostly remediable by the application of a small amount of common sense which, he laconically added, "is frequently wanting." The flashing-back of the atmospheric burner is probably the chief ailment. This, of course, is due to an excessive proportion of air to gas, attributable it may be to imperfect construction, but most frequently to some very simple and obvious deficiency produced during its use. He has found, for instance, in his own laboratory that the students frequently let liquids fall down the tube of the burner, and block up the gas orifices—thus giving a flame of a roaring character, with the evil habit of striking-back. A Bunsen burner requires to be cleaned out occasionally—both the tube of the burner and the gas orifices. If this were not done, troubles would be sure to follow. He often had occasion to notice the nauseous smell arising from badly behaving Bunsen burners. He has observed this in restaurants, and, whenever he notices it, he considers it his duty to look for the cause of the mischief; for an ill-conducted Bunsen burner is a source not only of evil smell, but of the production of poisonous gases, such as carbon monoxide, which, habitually inhaled in small quantities, produces serious consequences—visible frequently on the faces of people who live near defective gas appliances. This evil smell is not necessarily associated with the use of gas for heating, but is associated with foolish or ignorant people.

In connection with the development of the Bunsen burner resulting from the introduction of the incandescent light, Professor Smithells had not time on this occasion to speak of the many interesting scientific features of this great revolution in the use of coal gas. But it is a matter of particular interest to him, because, when in 1883 he was a student in Bunsen's laboratory, there came on the scene a man, somewhat older than the average student, who was engaged in investigating a group of rare chemical elements—full of scientific interest, but apparently of no practical importance whatever. This man was Baron Auer von Welsbach, and out of those somewhat obscure substances had arisen not only the mantles which meet the eye everywhere, but the fortune which Baron von Welsbach now enjoys in his castle on the Adriatic. In alluding to this, Professor Smithells jocularly remarked that he could not help thinking of the pathetic contrast between himself and his former distinguished fellow-student in respect of the pecuniary outcome of their researches. The lecturer exhibited the Welsbach burner of 1887, which he described as a not very brilliant form of Bunsen burner. Then he showed a "C" burner, which he alluded to as a distinct improvement. In connection with the latter he dealt with a complaint frequently made to him, that an evil gassy odour sometimes accompanies the use of these burners. This complaint he has justified in his own experience. He finds it always arises from the bye-pass, which does not seem to him to be arranged in the most perfect way imaginable. There is often a small leak of gas round the bye-pass nozzle, which, escaping round the small bye-pass flame, gets partially roasted and oxidized, and gives rise to evil-smelling and evil-acting gases in small quantities. Though he spoke with great diffidence about an appliance which has so many excellent points, he thinks that there is here distinct room for a little mechanical ingenuity. The lecturer next exhibited the Denayrouze, the Bandsept, and, lastly, the Kern burner, alluding briefly to the devices embodied in these inventions. He explained how surprisingly the efficiency of a Bunsen flame depends upon the complete mixing of the gas and air, and how this is effected in the burners in question. He referred to the use of the principle of the Venturi tube in the construction of the Kern burner, and dissected one before the audience. In using the incandescent burner, the object is to get a steady cone of flame in which to immerse the mantle; and the outer cone is the one selected. This suggested to Professor Smithells another experiment, in which an iron wire was stretched vertically down through the two separated cones of a Bunsen flame. It was plain beyond dispute that the part of the wire in the inner cone was the hottest. But when the cones were brought into proximity, the reverse was the case, because then, as the lecturer explained, the outer cone had not only the temperature due to its own combustion, but had, in addition, the resulting heat from the interior cone. It is thus made intelligible why the mantle should rest as correctly as possible in the outer cone of the flame.

Finally, Professor Smithells asked what things were to be attended to in the proper use of the Bunsen burner; and the simple rules he impressed in his last words upon his interested audience were these: First, you have to attend to the composition of the gas; for coal gas, though spoken of always by one name, varies, as everyone knows, in composition from town to town, and from time to time. Secondly, care must be taken to correctly proportion the quantity of admitted air to the quantity and character of the coal gas. Thirdly, for certain purposes arrangements must be made for the complete blending of the air and gas, and for increasing the supply of air beyond the ordinary limit, in which case, of course, special precautions must be taken against flashing-back. Fourthly, the Bunsen burner, like all other pieces of apparatus, must be kept clean. Lastly, in using the Bunsen burner, as much science and common sense must be employed as you can command.

There was an outburst of appreciative applause as Professor Smithells left the platform; but, called upon by the President, Mr. J. F. Smith (Halifax) formally moved, and Mr. G. W. Fligg (Dewsbury) seconded, a resolution presenting the warmest thanks of the members to Professor Smithells for his lecture and demonstrations, and to the authorities of Yorkshire College for their kindness in permitting the first meeting to be held there. Professor Smithells' acknowledgment brought to an end a highly intellectual treat for all who were fortunate enough to be present.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The Inaugural Meeting of this Association was held on Saturday at Leeds; and, for the occasion, the authorities of Yorkshire College generously placed the necessary accommodation in their beautiful buildings at the disposal of the members. Before noticing the proceedings, it may be remarked that the Association has made an excellent start. Already fifty members—representing 27 towns—have been enrolled; and the first President (Mr. W. Cranfield) tells us that the prospects are extremely bright. The members have done well in placing Mr. Cranfield in the presidential chair for the first year, because (it is hoped we are not betraying any confidence) he is remarkably fitted to pilot them to a well-established state—he having, through his gas classes in Bradford, Dewsbury, Huddersfield, and Greetland, obtained over the members the influence of a respected teacher and friend. In fact, it may be said that the Association originated in these classes. Yet another fact is that the qualifications for membership are most stringent. They are: "Any person holding a recognized official position, or holding a certificate of the City and Guilds of London Institute in Gas Manufacture, who is engaged at a gas-works, or at any works dealing with the working-up of gas-works residual products, or otherwise associated with gas manufacture, but who is not engaged in the manufacture of gas appliances." Anyone not coming within this rule need not apply for membership; but it is hoped that all junior members of the profession within the area of the Association who do comply with it will take an early opportunity of becoming members. The prospects for meetings are good. At the meeting on Saturday, a very healthy interest was taken in the work of officering the Association and getting things into working order; and for these purposes, nearly all—if not all—the members were in attendance on Saturday. Another great attraction, of course, was the kindly send-off which Professor Smithells gave the members by a lecture on the Bunsen

burner. In the evening, several gas engineers also responded to the invitation to attend the inaugural dinner, more about which will be found in the report.

The PRESIDENT, on taking the chair, said he was sure the members might congratulate themselves upon the conditions under which they were meeting, the place they were meeting in, and the representative gathering. There was not as yet an extensive record to present to them. The record such as they had mainly consisted of the history of the movement so far, and upon that the Secretary would report. The prospects of the Association were bright; and they had now a matter of fifty members. They were leaving for the decision of the new Committee the question of how often the meetings were to be held. They had promises for several meetings, and promises of much value. At the next meeting there would be a paper by Mr. J. F. Smith, of Halifax, on "Gaseous Firing." Subsequent to the next meeting, the Association were invited to inspect the tar-works of the Halifax Corporation; but whether or not they would be able to secure a paper or lecture by Mr. R. M. Stoddard, the Manager of the works, he was at present unable to say. Other arrangements were not sufficiently advanced for him to make an announcement upon them. Alluding to Professor Smithells' lecture, he said, when the Provisional Committee approached that gentleman for an address on the occasion of their inauguration, he kindly expressed himself as honoured by the suggestion that he could assist the Association, and his services were being gratuitously rendered, while they also had the loan of the College rooms for their meeting.

SECRETARY'S REPORT.

The HON. SECRETARY (Mr. Fred Scholefield, of Dewsbury) read a report from which the following paragraphs are taken:—

Perhaps as this is the first annual meeting in connection with the Yorkshire Junior Gas Association, it will not be out of place if I give, for the benefit of those who have not previously been present at the proceedings which led up to the Association being formed, a short account of the proceedings prior to this meeting.

Some two years ago, an Association of this description was suggested by Mr. Brearley, of Longwood, to a number of students in gas manufacture, who had the pleasure of visiting his works. The matter was many times discussed by members of a class in gas manufacture held at Dewsbury; and when, on March 28, 1903, some 33 students visited the Dewsbury works, Mr. Fligg brought the matter forward. After much discussion, it was decided that a Provisional Committee be appointed, consisting of two representatives each from the classes in gas manufacture, held in the Leeds, Bradford, Huddersfield, Dewsbury, and Greetland districts. The representatives elected were Mr. W. Cranfield, Messrs. Fligg and Sanderson (Dewsbury), Messrs. Benn and Bromley (Leeds), Messrs. Lang and Woodcock (Bradford), Messrs. Bottomley and Brook (Greetland), and Mr. Gomersal (Huddersfield), with myself as Hon. Secretary.

This Committee set to work formulating rules, and, on the 25th of April, decided to recommend them for adoption to a general meeting of the members called at the Bradford Technical College, on Saturday, May 25. This meeting took place, and the rules were adopted with a few alterations. The Provisional Committee were empowered to act, and manage the affairs of the Association until the Annual Meeting; the date of this meeting being fixed for Oct. 31. Letters and forms of application for membership have been sent to all likely persons; and up to the present fifty names have been enrolled as members of the Association.

The Committee will arrange for a number of papers on different subjects. They would respectfully draw the attention of members to the fact that, however elementary a paper may seem, the reading of the same not only assists the student who is reading it, but, by promoting discussion, tends to spread information. They therefore trust that each member during the coming session will make an effort to assist the Association.

The towns already represented in the Association are: Bradford (5), Elland (5), Leeds (3), Halifax (4), Dewsbury (3) Mirfield (3), Sowerby Bridge (2), Morley (2), Wakefield (2), Bingley (2), Shipley (2), Ossett (2), York (1), Redcar (1), King's Lynn (1), Normanton (1), Huddersfield (1), Manchester (1), Brighouse (1), Birstal (1), Ilkley (1), Harrogate (1), Slaithwaite (1), Luddendenfoot (1), Hull (1), Idle (1), and Yeadon (1).

ELECTION OF OFFICE-BEARERS.

Messrs. A. S. Brook (Ossett), H. D. Lumb (Mirfield), and W. Horsnall (Normanton) were appointed Scrutineers of the ballot-papers for office-bearers; and they subsequently reported the following elections—*President:* Mr. W. Cranfield, of Halifax (unopposed). *Vice-President:* Mr. J. F. Smith, of Halifax. *Hon. Treasurer:* Mr. H. D. Lumb, of Mirfield (unopposed). *Hon. Secretary:* Mr. Fred Scholefield, of Dewsbury (unopposed). *Committee:* Mr. E. Benn, of Leeds; Mr. J. W. Bottomley, of Elland; Mr. G. W. Fligg, of Dewsbury; Mr. W. Sanderson, of Mirfield; Mr. L. V. Whittaker, of Wakefield; and Mr. T. H. Woodcock, of Bradford. *Auditors:* Mr. F. Clough, of Morley; and Mr. J. E. Newsome, of Elland. For the Committee, Mr. J. Lang tied in the voting with Mr. Sanderson, but retired in his favour.

The PRESIDENT said he must express his gratitude to the gentlemen who had nominated him for the position he now occupied, and especially to his friend Mr. Smith who was also nominated, but persisted in withdrawing—almost to his (the President's) personal regret, because Mr. Smith would have filled the position with so much honour to the Association and so much advantage to the members. However, as the first occupant of the chair, he should do everything he possibly could to add to the usefulness of the Association and to further its interests. He was delighted Mr. Scholefield had been returned unopposed as Hon. Secretary. Not many besides himself knew how much work had devolved upon their friend, nor how much of the success of the arrangements which culminated in their meeting that day was due to him. The President then directed attention to the rules, which, he remarked, had been borrowed almost verbatim from their friends at Manchester.

The Scrutineers were thanked for their services, on the motion of Mr. C. T. B. ROPER (Bradford), seconded by Mr. J. F. SMITH.

Mr. L. WHITTAKER (Wakefield) moved a vote of thanks to the Provisional Committee for their work; and, on behalf of the members generally, he expressed their pleasure that Mr. Cranfield had been elected without opposition. He thought the President of an Association of this kind should—at any rate, at the start—be someone the members all knew. If they had elected anyone else, probably three parts of the members would not have known him. Mr. Cranfield was a gentleman they all respected, and to whom most of them no doubt owed a good deal.

Mr. BROOK seconded the motion, which was unanimously agreed to.

The PRESIDENT briefly acknowledged it, on behalf of himself and the Committee.

LECTURE ON THE BUNSEN BURNER.

The members then repaired to the lecture room, where Professor SMITHELLS delivered his lecture on "The Bunsen Burner." An account of the lecture, which will be found of great interest and value, appears on p. 289.

THE INAUGURAL DINNER.

The inaugural dinner took place at the Grand Restaurant, Boar Lane, the same evening. The President (Mr. W. Cranfield) occupied the chair, being supported on the right hand by Mr. H. Townsend (Wakefield) and on the left by Professor Smithells. Among the company present were Messrs. C. A. Craven (Dewsbury), J. H. Brearley (Longwood), J. W. Turner (Mirfield), J. Wilkinson (Halifax), W. M. Gardner, F.C.S. (Principal of the Municipal Technical College, Bradford), and R. H. Garlick (Salford), representing the Manchester Junior Gas Association. Between sixty and seventy sat down. After justice had been done to an excellent repast, the Secretary (Mr. F. Scholefield) announced that he had received communications from the following gentlemen regretting their inability to be present owing to other engagements, but sending their best wishes for the success of the Association: Mr. H. E. Jones (President of the Institution of Gas Engineers), Mr. Chas. Wood (Vice-President of the Institution of Gas Engineers), Dr. Colman (Examiner for the City and Guilds of London Institute), Principal Bodington (Yorkshire College), Dr. Cohen (Lecturer in Organic Chemistry, Yorkshire College), Dr. Rawson (Principal of the Huddersfield Municipal Technical School), Mr. J. Crowther, B.Sc. (Principal, Halifax Municipal Technical School), Mr. J. Laycock (Keighley), and Mr. W. Grafton (on behalf of the London Junior Gas Association), Mr. G. H. Wadsworth (the Chairman of the Halifax Corporation Gas Committee), and Mr. A. Crabtree (the Vice-Chairman of the Halifax Gas Committee).

After the usual loyal toasts had been honoured, Mr. C. A. Craven proposed "Success to the Yorkshire Junior Gas Association," and, in doing so, said he rejoiced to see the excellent way the young men of Yorkshire had gathered together that day; and it augured well for the ultimate success of the newly-formed Association. He was very glad to meet them in his own county of Yorkshire, and was very proud that they had given the Association a Yorkshire name. He (the speaker) had been for many years a member of the Manchester District Institution. The name of the Institution had always "stuck in his throat" a little; for he could not understand why they called it the "Manchester District," as the County of Yorkshire was certainly not a district of Manchester. (Laughter.) He would have preferred that they called it the "Lancashire and Yorkshire" and Districts Association; and he was sure that title would have been more in consonance with the feelings of the members. After referring to the many advantages possessed by Leeds for instruction and advancement in gas manufacture, Mr. Craven concluded by earnestly exhorting the members to apply themselves diligently to their studies, and success was bound to come. The toast was enthusiastically drunk, after which the President replied. In the course of his remarks, he repeated some of the information already reported at the general meeting. Practically the Association had originated through a remark dropped by Mr. J. H. Brearley, of Longwood, on the occasion of a visit of some gas engineers to his works. The suggestion lay simmering in a good many minds for about twelve months, and finally took form. The Association had risen spontaneously; and he was sure of its success. They thankfully acknowledged the sympathy and good advice received from many of the Yorkshire gas managers; but, in the main, so far they had stood on their own feet. They had refrained from seeking honorary members; and they had refrained from asking anything more than sympathy from the seniors—(laughter)—he meant in regard to permission to visit their works. The aims of the new Association were, primarily, educational. They did not

hope for either pecuniary advantage or any advantage as regards personal status, or any commercial advantage. They had already secured the promise of papers, and they also hoped to establish a library. He most earnestly counselled those present to give their time to study and research. The Association would help them in every possible way. There was a great change coming over the gas industry. In the past there had been few professions that had had so many positions for the rank and file. Striking improvements, known to all of them, had been effected, and there was promise in the future to an exceptional degree for the young men of the gas industry.

Mr. G. W. Fligg (Dewsbury) having proposed "The Sister Junior Associations," Mr. R. H. Garlick (Salford) replied. He wished them every success in this new Association, and suggested an interchange of papers between the Yorkshire and Manchester Associations.

The toast of the "Senior Associations" was proposed by the Vice-President; and, in the absence of Mr. Charles Wood, it was responded to, on behalf of the Institution of Gas Engineers, by Mr. H. Townsend. He said that the Institution had a very lively regard for the junior members of the gas industry, and reminded them that the address of the President last June was nearly wholly devoted to the welfare of the juniors—and the Institution had a very wide charter. (Laughter.) The Institution had the necessary machinery for affiliating all the Senior Associations, and, through the Senior Associations, all the Junior Associations—in fact, they had gone so far as to take powers to examine the juniors as an auxiliary to the City and Guilds of London Institute. Mr. J. H. Brearley, in replying on behalf of the Manchester Institution, said that they had heard with pleasure the good advice given to the juniors that night by Mr. Craven. That gentleman had said he was managing a gas-works in 1862, and was then only 22 years of age. By a simple process of arithmetric they could gather Mr. Craven's present age; and he thought that was the best answer to some of the absurd limits put in present day advertisements for gas managers, where the age was generally specified "40 to 45." They were all deeply indebted to Professor Smithells for his lecture that afternoon. He admired very much —as they all did—Professor Smithells' courage in boldly tackling Professor Lewes's theory that the luminosity of coal-gas flames was due, first to the creation of acetylene and then to the dismemberment of acetylene. In reading that controversy, at the time, he could not help thinking how much the work-a-day gas engineers were in the hands of the professors for theories. The gas managers had very little time for research work; and they must of necessity look to the professors for a lead in those matters.

Professor Smithells on Applied Science and Gas Lighting.

Mr. Pettigrew (Teacher in Gas Manufacture at the Leeds Technical Schools) having proposed "The Universities, and other Educational Authorities,"

Professor Smithells said, in reply, that it was really too bad that he should inflict himself on them again after having detained them so long at the lecture that afternoon; but he used no empty form of words when he said that it afforded him very great pleasure to assist in the inauguration of the new Association. There were several reasons for this. The subject in which their interests were centred, and in whose furtherance they looked forward to spending their lives, was one which, more than any other, had interested him in its scientific side, and one whose problems had afforded, and would still afford, many a life-work for a man of science. The evidence which the formation of their Association afforded, that there was an increasing desire on the part of the younger members of the gas industry to attend to the scientific basis of their calling, was necessarily most gratifying to one who believed that no man's work was what it should be, unless it engaged and exercised, as fully as possible, his powers of understanding, unless it acquired an intellectual interest and gave him that pleasure which was only possible to a man who was working in the light of knowledge. They often heard of a particular calling being in a special degree noble or dignified; but the nobility or dignity of an occupation depended, mainly, not on what it was, but on the spirit in which it was followed. He belonged to a class of people who were often suspected—and he feared sometimes justly suspected—of looking down as superior persons on those whose busy lives were devoted to the work-a-day labour of the world. For his own part, he confessed he did look with a certain amount of pity on a great section of the manufacturing and commercial community, whether masters or men; but that was only because he knew that they were working hard, and working contentedly, without the power or even the desire to imbue their work with those delights of mind and that refreshment of spirit that came from a connection of practical life with intellectual life. They heard a great deal about technical education and its importance for the furtherance of their national prosperity. Certainly it was most important; but what he cared for most was technical education, because it involved that those who received it, should have acquired the means of combining intellectual interests with their daily work. He did not believe that there was a single occupation with which these interests could not be interwoven, nor a single mind to which some of those interests were impossible; and he was quite certain that a knowledge even of the elementary principles of chemistry would put a fresh complexion on the daily work of thousands of people in Leeds. He knew men at the head of large undertakings whose operations were nothing but chemical experiments on a vast scale—men who were very prosperous and perfectly self-satisfied —who had not the dimmest notion of the scientific laws in obedience to which they worked and earned their ample fortunes. Sometimes it was that those men had not had the opportunity, and then they were to be pitied; but frequently they had not had the desire, nor did they even encourage it in others, to illuminate their work by a knowledge of its real inwardness. They awaited the proof that it would pay—pay in hard cash—and even there they were hardly less obstinate and undiscerning. He did not wish to set himself above the consideration of making work pecuniarily profitable. He was as anxious as anyone to see the industries of the country advance and prosper; but to them he did not think it necessary that he should preach the doctrine that industries might be advanced, and the material condition of the people improved, by the applications of science. He was glad to see the desire of young men to equip themselves on the educational side in life. Experience, however, had shown him that there were many difficulties confronting these people. There was the difficulty of giving technical education to those who had not had the preliminary education. His chief advice to those present was, "Attend to your preliminary education, and lay your foundations broad enough." Any attempt to go straight to applied science was futile; it could not be captured in that way. They must first learn the principles of science, and not only that, but they would find that they could not learn the principles of one science without learning previously or simultaneously the principles of other sciences. So that at the outset of their campaign, it would be probable that the plan of operations made for them would seem to lead them in no degree towards their real objective. In regard to the science of gas making, he advised them to study mathematics, physics, and general chemistry at least. Without them, they would never really reach the science of gas making. They might have mother-wit, ingenuity, resourcefulness, and general level-headedness. These were excellent qualities; they would carry them far. More than anything else it was these qualities that had given this country that general industrial prosperity which they now heard was so seriously threatened. He admitted they could not do without these qualities. No science, no fiscal reform would avail them anything without them. But they were not science; and when they wanted to learn science, he asked them to pay some attention to the warning and advice of people like himself whose business it was, by life-long study and trial, to find the best way of teaching science for all the various purposes to which it might be put. The chief advice, the chief warning, which he gave them was to lay down proper foundations of knowledge before they sought to specialize. There lay the chief difference between Britishers and those nations who were more advanced in the application of science to industry. The Britisher looked with deeply-rooted distrust on anything which he did not conceive to be thoroughly practical; he used the words "theory" and "theorist" as terms of opprobrium. Wiser people knew that sound theory was the very life-blood of every successful practice. He (the speaker) was deeply interested in the gas industry. The only technical or trade journal that he read regularly was one concerned with gas lighting. He learned much from it in many ways; and he valued it highly. He would only mention, now, one thing he had learned from it; and it was that the British gas industry was lamentably wanting in men who were scientific masters of their craft. Brilliant men there were in it, he knew full well, and far be it from him to underestimate the qualities which, as he had said, must always supplement scientific learning, if scientific learning was to be made available. But the science which was involved in gas-making and gas-using in its highest development was high science, deep science, and not science that could be picked up casually by the wayside. He believed that there were extremely few men in the British gas industry who were equipped with such science. Such a state of things should be remedied. He had in his mind more than one measure that might be taken, but that night he would merely say that it was because he saw in their Association—the formation of which had been so sedulously and successfully furthered by his friend Mr. Cranfield—an unmistakable step in the direction he had indicated, that he took so much pleasure in being present among them, and felt so confident in the wisdom and utility of their undertaking.

The Next Meeting.

It is proposed to hold the next meeting during the first or second week in December, when, as already mentioned, a paper will be read by Mr. J. F. Smith (the Chemist at the Halifax Corporation Gas-Works) on, "Gaseous Firing."

Designing Ironwork.—In a previous issue of the "Journal," we noticed one of a new series of pamphlets by Mr. Henry Adams, M.Inst.C.E., the Professor of Engineering at the City of London College, on the above subject. The fourth part has just been published by Messrs. E. & F. N. Spon, Limited, and it contains general data on rolled steel joists, compound girders, concrete, and fire-resisting materials. These are followed by calculations and working drawings for a fire-proof floor. In the three preceding parts, the author dealt with steel box girders, built-up steel stanchions, and cisterns and tanks; and all are full of information concisely presented to the reader.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Address by the President—The Future of Gas.

The first Meeting of the Association for the present session was held at the Regent Street Polytechnic last Friday; the programme consisting of the distribution of prizes and certificates to those members who had been successful in the last City and Guilds of London Institute and Polytechnic Examinations in Gas Manufacture, a short address by the President (Mr. Walter Grafton, F.C.S.), and the discussion of the paper read at the closing meeting of last session by Mr. W. Upton on "The Future of the Gas Industry." The prizes awarded to members included the first prize in the honours grade of the City and Guilds examination, to Mr. G. J. Clark; the first prize in the honours grade of the Polytechnic examination, to Mr. F. Stanley Larkin; and the first prize in the ordinary grade of the Polytechnic examination, to Mr. R. H. Chree.

This portion of the business having been disposed of, Mr. Grafton briefly addressed the members. He remarked that the Association had completed one short year's existence, and that, if they were to complete any more, one of their first aims must be unity of purpose. The members should do all they could for the welfare of others, and not let selfish motives govern their individual actions. The Association, when formed, had for its primary object the extension of the knowledge of each member; and as the possession of knowledge was power, so did union give strength. Union, however, was not everything. They must be up and doing, at their daily calling and away from it. Touching upon the future of the Association, and the work that might be performed by it, he said surely they did not want, as often happened in larger societies, a few to do all the work—like the Secretary and the Council. Each member must do his best to support them, by reading a paper, putting a question, or taking part in the discussions. Their purpose, however humbly, was the advancement of gas as a cheap, convenient, and clean means of lighting, heating, and providing power. Many of the members had passed the highest examination which existed to test their technical education in the science and practice of gas manufacture; but they must still thirst after knowledge by taking up some kindred science, and so enable themselves to dig further into the mysteries surrounding gas. Very much had still to be found out before it could be said truthfully that all was discovered. They must not be discouraged. It was necessary for them to work as hard as their forefathers did, if they were ever to reach their ideal goal. The present enlightened days did not mean greater ease. On the contrary, harder work must be done, if they expected to rise to eminence. Besides being power, knowledge was wealth; and they certainly could not expect wealth without knowledge. If they worked well and honourably, they would be rewarded in the long run, though much that they did might often at the time appear useless and trying.

After appealing to the members to support the Council liberally by contributing papers, Mr. Grafton pointed out that the Institution of Gas Engineers desired the affiliation of the District Associations. If those present were only junior members now, they would grow older; and consequently he believed that if their Association proved a useful one, it would find shelter under the wing of the Institution. Besides this, Mr. A. Dougall, the ex-President of the Institution, had provided a way for the admittance of students, if not for Junior District Associations. They might one day see the industry in possession of a model gas-works of its own, to be used for the educational equipment of its students; and he thought that an experimental and research works could be founded by making a charge of 2s. or so per million cubic feet of gas made per annum in the United Kingdom. Such a charge as this would certainly not be felt by gas companies and corporations. Mr. Grafton concluded his address by giving some particulars as to the result of nine years' work in the gas manufacture classes at the Polytechnic. A table which he had prepared showed that 232 students had received instruction and been examined there by the authorities of the City and Guilds of London Institute. Of this number, 137 (or just under 60 per cent.) had passed—including 24 first class in the honours grade and 48 first class in the ordinary grade. Besides this, six students had passed the London County Council examination. His students have also gained 8 silver and 8 bronze medals and £81 in prizes.

Discussion having been invited on Mr. Upton's paper, Mr. R. H. Brown remarked that he was very much of the same opinion as the author, when he said that opinion seemed to be slowly changing over in favour of horizontal retorts, with mechanical chargers—especially as coal projectors were now being put up in various places. Mr. Upton did not seem to favour the present ⏢-shaped retort, but thought that a rectangular form would give better results. He would like to ask whether this was only a theoretical idea, because he would be glad to know how the rectangular form could be made strong enough for the brickwork above. He believed that the circular form was originally intended to resist the pressure of the brickwork, and that it might expand and contract readily. In his opinion, the ⏢-shaped retort nearly approached perfection. By converting this to a rectangular form, the weakness existing in the ⏢ shape would be increased by 6 per cent. How, therefore, could it be made strong enough to work in practice? On the question of the guide-framing of gasholders, he could not quite agree with Mr. Upton. A holder without guide-framing was something like a table without legs—there must be something put in their stead. If they had not got the support in one place, they must have it in another. As regarded a spiral guided holder, the cost was not so very much lower than that of one with guide-framing—not more than £1 per ton, or (say) 8d. per 1000 cubic feet for sizes of over a million cubic feet. With the other form of frameless holder there had lately been one or two rather funny accidents, to which he might take an opportunity of referring on some future occasion. He was entirely in accord with Mr. Upton's views as to the need for high-pressure distribution; and he had often wondered why this plan had not become general. It must be easy to make pipes sufficiently tight to supply gas at high pressure, seeing that water-mains were made to stand a pressure of several hundred feet head. The question of supplying power gas would have to be taken seriously into consideration in the future, especially by large gas undertakings.

The next speaker was Mr. F. H. Wedd, who said he noticed that Mr. Upton suggested driving his coke out of a 20-foot narrow retort; and he asked whether this would not be a very serious affair, and whether the coke would not jam and smash the retort. If treated in that way, it seemed to him rather likely to do so. He also noticed the remark that in the Dellwik water-gas process the coke was burned entirely to carbonic acid; but it must be something more than that, or else they would not get the high temperature flame that was seen coming out of the stack-pipe. Then the author spoke of a mixture of coal tar and water gas; but if they made this, and had to enrich it, what would be the price of oil in six months?

Mr. Grafton, in his remarks, first referred to the rectangular form of retort, which he stated did not seem to him to be at all workable. The author said by this means he would not only get more gas for the same cubical space occupied, but a better quality of coke. He (Mr. Grafton) did not, however, himself think that the retort would act in practice, though it might be all right in theory. A great difficulty would be to find a suitable mouthpiece for it. When pointing out that they were now content to transform from 15 to 17 per cent. of the weight of the raw material into gas, Mr. Upton seemed to condemn the practice of having so little gas and such a large quantity of bye-products. He took it that his idea was to convert as much of the tar as possible and the whole of the coke into gas, by means of the water-gas process—leaving only the 8 per cent. of liquor as a waste product. No doubt this was all right; but he (the speaker) could not quite make up his mind whether they could afford to give away all their coke in the shape of gas. The day had not yet come when coke could be said to be of no use. Great pains had been taken to give in the paper the yield of this mixed gas and its heating power. It was also stated that 66 per cent. of the total make of gas in the United Kingdom was of 16-candle power and under. He did not think the other 34 per cent. would linger much longer; for 16-candle gas seemed as good as most people wanted, and nothing above it was necessary in these days of incandescent lighting. As to the gasification of the tar, he did not think it would be possible to carry this out in the way the author suggested, though apparently he referred more particularly to the methane-hydrogen process of Mr. Tully and Professor Lewes, which was workable, but not on any very great scale. This system was good, because they got a larger percentage of hydrogen than in any other way; and it was a means of working up otherwise waste tar, which was difficult to get rid of. Mr. Upton gave 14-candle gas as representing 500 British thermal units; but he (Mr. Grafton) was not quite sure whether he was right in taking this as the net value. He thought the remark as to the carbonic acid was an error, and that it was not the intention of the writer of the paper to state the product of the Dellwik water-gas plant in this way. He was sorry that there had not been a better discussion, so as to have rewarded the author for the great trouble he had taken in the preparation of such a useful paper for the Association.

The first point dealt with by Mr. Upton in his reply was the rectangular retort. He admitted that this was a highly contentious question, and said he did not mean to tie himself down to an absolutely rectangular form; but this was somewhat the shape he advocated. Of course, he was quite aware that the corners would be weak, and most probably an exactly rectangular retort would be unworkable; but how about an oval retort placed the reverse way to what was the custom? This was more the idea in his mind. The objection he put forth against the ⏢-shaped retort was that the only heating surface was along the bottom, and just over the few inches on each side that the charge might rest against. The only work done by the large area over the charge was to break up the gas. If they fixed an oval retort in the position he suggested, the heating surface would be down both sides and round the bottom, and would thus be largely increased; while the waste space (he used this word merely to make clear his meaning) would be something like one-third of the total depth of the retort. By the gas space at the top being smaller than in retorts as usually set, it was clearly evident (taking both forms as holding the same charge) that the gas would remain in it for a much shorter period of time; and this was a decided advantage. The object, he took it, of using an exhauster at all was to get the gas away from the retort practically as soon as ever it

was formed. It did not, however, appear according to some of the best authorities, to be the thing to pull the gas away immediately, because if this were done there would be a large amount of condensable vapours; whereas if the gas was for a short period in contact with the highly heated surface, or was subjected to a radiant heat, a large portion of these condensable vapours was rendered permanent. In the usual oval retort, the heat had to work entirely from the bottom, and gradually; and it seemed to him that it would be a great advantage if it could be made to penetrate from the side of the retort to the centre. Whether the form of retort he suggested would be strong enough, Mr. Brown might on some future occasion be able to tell them. Referring to the relative cost of gasholders with and without guide-framing, he said he was not prepared to enter into this matter just at the moment. He put this idea out more as a side issue from the main character of the paper, with the object of bringing to mind for a moment the fact that new systems were being brought before their notice. It behoved them to keep track of such things, and to look out for particulars which would enable them to form a correct idea as to their value. Then as to whether the coke would not jam in a 20-foot narrow retort as advocated. There was no doubt that coke would jam more in this pattern than in the present oval shape. There was now room for the coke to expand; and the members would, of course, be aware that the modified Ω as made nowadays was adapted to allow for this, by the sides being flattened a bit. In his retort there would not be this expansion; and two considerations would thus come in. First, the coke would be denser because the charge in the retort would be heavier, it being two-thirds the depth of the retort; and, secondly, the coke not being allowed to expand, it would become closer in texture, and therefore would be better in quality than that at present made, the fault of which was its porosity. He did not see that there would be any difficulty in clearing the retorts; this was a mere question of mechanical detail. Quite recently they had had particulars of a French installation, in which the retorts could be discharged by a ram; and in view of the results claimed for this, it should only be a matter of practice to successfully clear such a retort as he had hinted at. If the brickwork was strong enough, he did not see that there need be any trouble at all in clearing it. Heavy charges of from 6 to 8 tons of coal—or, say, 4 to 5 tons of coke—were discharged from those coke-oven plants of which they heard so much nowadays; and if they could be cleared rapidly and without difficulty, it might be said that the question of the ram discharger had been tackled with a considerable amount of success. He would not therefore anticipate any trouble under that head. With reference to the remark that the coke in the Dellwik water-gas process was burnt entirely to carbonic acid, of course this could not really be done. If any of them had a generator that would do it, they had better patent it at once. What he meant to convey was that the carbon was turned more to carbonic acid in the Dellwik than in other plants as worked at the present moment. He did not express any opinion as to what might or might not be done with the existing plants if the conditions were altered; but taking them as they now were, the Dellwik certainly burnt more to carbonic acid. Then as to the cost that would be incurred in raising the gas derived from all of the combustibles in the coal from 5¼ to 14 candles, by the use of oil. Of course, this increase of illuminating power was simply shown in the paper to indicate the calorific value. The oil market was pretty stiff; and what would be the difference if all the gas made was raised from 5¼ to 14 candles, he should not like to say. The day of 5-candle gas, however, had not yet arrived; and he therefore did not think they need consider the increase that would take place in the price of oil under the circumstances mentioned. He might say that, taking his rough calculations, a 16-candle mixed gas as they had it at the present day—say, 75 per cent. coal gas and 25 per cent. water gas—would give 40 British thermal units for a penny. This 5¼-candle gas, made by gasifying everything possible, would give 50 British thermal units; and if it were enriched to 14 candles by the use of oil, it would only furnish 51 British thermal units for a penny—or 1 unit more. Whether or not they could afford to dispose of all their coke by turning it into gas, was a point which would certainly bear looking into. If they took the price which they at present received for coke, and the price which the same coke would fetch if converted into gas, in the form of carburetted water gas, and allowed for the cost of oil, it would pay them much better to dispose of it as gas than to sell it in the open market, in which case they would probably have to pay to send it out of the district. He believed he was correct in stating that the calorific power given for the 14-candle gas was net. In reply to a question, Mr. Upton said he did not exactly intend to compare the cost of working of horizontal and inclined retorts. The point he was driving at was, what would be the future method of gas making; and what he had in his mind was West's latest form of drawing and charging machine. In conclusion, he urged that they should do all they could to improve the quality of their coke, so that it might command a better price; and he referred to the statement in his paper that the manager of a Scotch works had, by the adoption of a 1-ton charge, raised the value of his coke from 11s. to 14s. a ton.

A hearty vote of thanks was accorded Mr. Upton for his paper; and it was agreed that the November meeting of the Association should take the form of a visit to a Suburban gas-works.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The Fifth Annual General Meeting of the Association was held on Saturday, at the Manchester School of Technology. The chair was occupied by the retiring President, Mr. S. E. Halliwell, of Littleborough. The Hon. Secretary (Mr. F. Oldfield, of Denton) announced that Mr. Garlick was representing the Association that day at a meeting of the Yorkshire Junior Gas Association; and it was agreed to send a telegram of congratulation to the Yorkshire Association, coupled with the wish of the members that they might have a successful session.

The report and balance-sheet which were presented showed that the Association now has a membership-roll of 67, as against 57 last year, and 40 at the first annual meeting. There was a balance in hand of £20 4s. 11d., as compared with £15 19s. last year. After referring to the papers read and the visits made to works during the past twelve months, the report states that the lack of facilities for obtaining sound technical knowledge in the engineering branch of a gas undertaking has received the consideration of the Council; and they have been fortunate in securing the co-operation of Mr. J. H. Reynolds, Director of Technical Education, in the formation of a Gas Engineering Class conducted by Mr. J. Russell Hartley, of the Salford Corporation Gas-Works. The Council are anxious that all the members should avail themselves of the opportunity of attending these lectures. It having been pointed out by Mr. James Wareham, one of the Auditors, that the Council's expenses for the past year should have been included in the balance-sheet, it was agreed that this should be done; and the report and accounts, as amended, were then adopted. The inclusion of the Council's expenses, £2 9s. 9d., makes the cash in hand £17 15s. 2d.

On the motion of Mr. C. Berry, seconded by Mr. H. Smith, Rule 9 was altered so as to provide for only one Hon. Secretary, instead of two, and the addition of one to the Members of Council, to take the place of the second Hon. Secretary not now needed. Mr. Wellens, one of the Joint Secretaries, having left to take up an appointment elsewhere, it was thought better to leave the whole of the secretarial work in the hands of Mr. Oldfield, who was willing that this should be done. Mr. Halliwell then vacated the chair, which was taken by Mr. W. Hill, of Stalybridge, the incoming President, who delivered a short address.

Mr. Hill commenced his address by some reference to the work of the Association and the need that existed for daytime courses of study in gas manufacture. He then suggested that it might be possible for them during the winter to arrange a course of lectures for the workmen. Some might ask whether it was of any use, and whether it would do any good to the trade. His reply to this was that they should do their utmost to raise the standard of their workmen. And while they tried to raise the standard of the workmen, as far as the industry was concerned, could they not encourage the love for books treating on gas? He regretted that the idea of providing an experimental gas-works had not yet borne fruit, and ventured to say that a scheme formulated by the Institution of Gas Engineers was likely to be so expensive that they must yet wait a considerable time before their hopes would be realized. Surely, meanwhile, it was possible that an arrangement could be made at the gas-works of some of the large towns for the carrying out of experiments, at which the ablest professors in the gas industry might assist by their direction and advice. This, at any rate, would be a step in the right direction; and he was certain that information of great value would thus be gained, which would be of the utmost importance to those engaged in the industry. Probably also grants might be made towards such an undertaking by all gas companies and corporations. He did not hesitate to say that the gas industry suffered considerably from the treatment of the directors and committeemen who allowed electricity to be sold under cost price for motive power, while heavily taxing gas used for the same purpose. A man starting in business, and requiring such power, was told by the makers of electric motors that he could be supplied by electricity at a figure which was below cost price. But the unfortunate owner of a gas-engine was supplied, not at cost price, but probably at 6d. per 1000 cubic feet above. In addition, he had the pleasure of paying (say) 3d. in the pound to supply the electric current. This seemed hardly like fair treatment of competition.

Mr. Hill then proceeded to give a brief sketch of the history of the Stalybridge Gas-Works. He said they were founded about 1842, by a private Company, who carried on operations till 1885, when the works were purchased by the Corporation. The Company paid dividends of 10, 8, and 7 per cent., amounting to nearly £7000. The purchase price was £108,000. Prior to the negotiations for purchase, Stalybridge paid 3s. 3d. per 1000 cubic feet for gas; whereas last year it was sold at 2s. 4d., and now it was 2s. 3d. The quantity sold in 1885 was about 90 millions; now it was 160 millions. The works then could make about 600,000 cubic feet daily; now they could manufacture nearly twice as much. No very large extensions of buildings had taken place under the Corporation; but the plant had all been re-modelled, and brought up to modern practice. The chief additions and improvements were as follows: Sulphate of ammonia plant and building, purifiers

and purifying-house, coal-stores and workshops, a couple of three-lift gasholders, patent washer, and regenerator settings. Many miles of new mains had been laid, and large quantities of slot meters and cooking stoves purchased to let out on hire. A large new steam-boiler and two exhausters had been bought, a large chimney rebuilt, and many facilities provided to ease labour and promote rapid working. These changes cost about £25,000. But the addition to the capital had only been £18,425; and as £14,314 had been written off by the sinking fund, the increase made to capital was only £4111. When the works were bought, each £1000 of capital produced a possible daily make of 5454 cubic feet; now each £1000 of capital provided a daily make of over 10,000 feet. The works were at present in such a condition that capital expenditure should be very small for some years. Bearing upon this question, much depended upon the amount spent in repairs. Last year, the sum was £3246, or about 5d. per 1000 cubic feet. In 1894, it was £1573, or less than 4d. per 1000 feet. The better the condition of the works and mains, the more gas will be obtained and sold per ton of coal, and the less the leakage in the works or in the mains. The leakage in 1894 was over 10 per cent. more than last year.

At the conclusion of the address, the following gentlemen were elected officers of the Association for the ensuing year: Vice-President: Mr. H. Smith (Bury). Members of Council: Messrs. L. G. Barber (Salford), J. Taylor (Hollinwood), W. Baxendale (Chorley), J. E. Dudley (Oldham), R. H. Ginman (Tyldesley), and H. Pickford (Farnworth). Hon. Secretary: Mr. F. Oldfield (Denton). Treasurer: Mr. R. H. Garlick (Salford). Auditors: Messrs. J. Wareham and C. Berry.

Mr. Halliwell moved, and Mr. Ginman seconded, a vote of thanks to the President for his valuable and interesting address; the former gentleman remarking that they had already done something in the way of education for gas engineering students, and there was much more useful work the Association might very well take up in the future. The President, in thanking the members for their vote, suggested that they should at that meeting try and formulate some scheme for the present session. Mr. Berry did not think anyone had come to the meeting prepared with a scheme; and it would therefore be better to leave the matter to the Council.

The services rendered to the Association by the retiring President, the Secretaries, and the Council having been suitably acknowledged, the meeting separated.

DIRECTIONS FOR THE LIGHTING OF FRENCH BARRACKS.

Rather more than three years ago, the Forage, Heating, and Lighting Department of the French Military Administration issued a series of regulations in regard to the warming and lighting of barracks. These were supplemented early in the present year by further instructions in regard to lighting, which have been published in the "Revue du Génie Militaire." The object of the Department was to give a general indication of the amount of artificial light which they considered necessary in the different parts of barracks, and of the capacity of the appliances employed to produce it, and to offer a few observations for the guidance of quartermasters and others in connection with their purchase and maintenance. In view of the variety of arrangements now in existence for lighting interiors, and the changes which take place therein from year to year, the instructions are of a suggestive rather than of an obligatory character. They consist, first, of remarks on the principles applicable to lighting; secondly, of a consideration of the merits of each system separately. The following is an abstract translation of the portion of the document dealing with gas lighting.

In the introductory remarks, it is pointed out that, owing to the heavy annual expenditure incurred in barrack-lighting, the extent of the illumination has been limited strictly to absolute requirements. Makers of lamps and representatives of gas and electricity supply companies, who are accustomed to the more brilliant lighting which is now required for public and private purposes, are not always in a position to furnish accurate information respecting the kinds of appliances to employ in the special cases under consideration; and, moreover, their private interests in this matter are sometimes opposed to those of the State. It was therefore thought that an official pronouncement should be made thereon. In the directions laid down, illuminating power is always given in decimal candles (1 d.c. = 0·1 carcel); but the figures are only averages, which may vary considerably with the locality. They apply to new apparatus; and in arriving at them it has been assumed that the burners will yield sufficient light for their purpose after the initial luminous intensity of the gas has been somewhat diminished with wear. The employment of reflectors, which is often found useful, is essential in certain cases, such as in rooms, offices, riding-schools, &c.; and this has been taken into account in the references to these places.

Though by the employment of incandescent burners economy is effected and increased illumination obtained, batswing burners are to be preferred in certain cases. These burners are generally classified according to the quantity of gas consumed per hour. If suitably regulated, it yields the following results: 50 litres (1·76 cubic feet), 2 or 3 candles; 80 litres (2·82 cubic feet), 5 candles; 100 litres (3·53 cubic feet), 7 candles; and 140 litres (5 cubic feet), 11 candles. For consumptions of 100 litres and less, the "Manchester" burner, in which the slit of the batswing is replaced by two holes opposite each other, is often preferred. The shape of the flame and the illuminating effect of a similar quantity of gas differ but little. The removal of obstructions is, however, more troublesome with the "Manchester" than with the batswing.

The types of burners to be preferably selected, for the various parts of a barracks, are the following.

Yards.—Burners of 140 litres capacity, as usually employed for street lighting. The distances between the lights should be from 60 to 100 metres (197 to 328 feet) in large yards, and from 40 to 60 metres (130 to 197 feet) in small ones. The object is not generally to illuminate the yards so brilliantly as public thoroughfares, but to set up marks to indicate the path to be followed and the chief entrances to the buildings. In small yards, care should be taken to light the vicinity of latrines, stables, and kitchens.

Staircases, Corridors, and Latrines.—Burners of 50 or 80 litres capacity, according to the distance between the jets which the area will allow. The lights should be rather numerous, so that steps can be distinguished and falls avoided. The shadow of the hand-rail should fall as far as possible beyond the stairs. One of the best arrangements seems to be to place a light on each landing, to illuminate the steps above as well as those below, and also part of the corridor. Here, however, as there are no obstacles, and the place is frequented only at night by men accustomed to it, the lights may be about 10 feet apart in a straight line. Corners should be utilized to illuminate in two directions. The heights of the lights should be such that they cannot be reached without the use of a stool—say, about 7 ft. 6 in. An illuminating power of 3 to 6 candles suffices for these lights, which burn all night, and consequently should not involve very great expense per hour. When the arrangement of the place makes it necessary to have burners close together, a light equal to 2·3 candles is sufficient. The same power may be adopted for latrines.

Rooms, Lavatories, and Stables.—Burners of 100 litres capacity. Gas should not be employed in badly ventilated places. There should be two lights per room of 24 to 28 men, fixed above the usual place for the table; the position of the bread-shelf being taken into account. The most suitable height to avoid accidental knocks, and yet illuminate the apartment and the clothes-shelf, is from 7 to 8 feet. The lighting should be good enough to allow of reading at the tables without much fatigue—say, from 6 to 10 candles; and for smaller or larger rooms in proportion. The same lights can be used for the lavatories. With regard to stables, the object is to light all parts sufficiently to enable saddling, unsaddling, and grooming to be done. In those with two rows of stalls, the best height is 13 to 16 feet; but with a single row, the height should be less, though not lower than 8 feet, so that the men cannot reach the light too easily. A single light of 8 to 10 candles suffices for a stable of 28 horses—say, 72 feet in length. Two lights are needed for a longer one. As this lighting is not kept on all night, stablemen should have portable lanterns.

Mess-Rooms, Fencing-Schools, and Kitchens.—Burners of 140 litres capacity. The total power needed for a mess-room of about 1000 square feet may be estimated at from 30 to 40 candles. The light should be distributed either from two points placed very high, or four at an altitude of 8 feet. The same remarks apply to the fencing-schools and kitchens, in proportion to their superficial area; but the sculleries only require from 3 to 6 candles.

Offices and Schools.—As a general rule, the incandescent burner should be employed in preference to the batswing for these places in all new installations. In the offices, the lights should be a maximum of 2 ft. 8 in. above the tables, and have an illuminating power of 8 to 10 candles. In schools, the lights should be about 7 feet above the ground in the place occupied by the tables—an average of 2 candles for each 10 square feet of area in that part of the room. A light is also needed for the blackboard.

Riding-Schools.—When exceptional circumstances prevent the use of incandescent burners, batswings may be employed. The general illumination should be sufficient for the riding-master to clearly distinguish the movements of the horses and riders along the track. The lights should be placed at such a height that they will only be exceptionally reached by the lash of the whip—say about 16 feet. In schools from 65 to 70 feet wide, the lights are usually arranged in two lines, about 16 feet from the walls. Thus the total luminous intensity actually adopted (since the substitution of incandescent for batswing burners and electric lamps) is 1200 to 1500 candles for a school about 200 feet long, and from 800 to 1000 candles for one 150 feet in length. In a school from 180 to 200 feet long, burners having a capacity of 150 litres are employed, arranged in fourteen groups of four.

Maintenance of batswing burners consists simply of the frequent clearing of the slit, which becomes partially obstructed by oxidation, producing a jagged flame of feeble power. This operation should be performed with a bristle, wire, or special pricker, not with a knife-blade, which might damage the slit, or even break the burner. Steatite burners, being fragile, are not recommended for barrack-lighting. The cheap cast-iron burners which are easily replaced when worn, are best. The actual consumption of a batswing burner depends, in a large measure, upon the pressure of gas in the main and the extent to which the tap is turned. It often happens that a burner with a nominal consumption of 50 litres per hour passes twice this quantity. It is

consequently, desirable to so arrange the burners in barracks that the man whose duty it is to light them will only have to turn the taps full on, without troubling himself about the pressure in the pipes. This, of course, may be effected by means of regulators, whether fixed near the meter or fitted to each burner. In barracks, a regulator at each burner is preferable to one fixed at the meter. One of the most generally used appliances of this type in France is the Giroud rheometer, which is made for various deliveries, as marked upon it.

It now remains to speak of incandescent burners. The consumption and illuminating power of the principal Auer burners now in use may be approximately stated as follows.

Alpha, passing	25	litres per hour,	. . . .	10	candles.
B B	,, 40	,,	. . . .	25	,,
No. 1	,, 85	,,	. . . .	50	,,
No. 2	,, 115	,,	. . . .	65	,,
No. 3	,, 150	,,	. . . .	120	,,

In order to utilize this table, the following observations must be attended to. In the first place, the indicated consumptions are often exceeded in practice, when regulation is not well done. It is therefore advisable to reckon an average of one-fourth more than the quantity stated. Next, the illuminating powers are not absolutely comparable with those of the batswing burner or the petroleum lamp. A greater number of candles than that strictly requisite with the latter sources of light must always be calculated. Finally, the 25-litre burner has only quite recently been adopted; and consequently, until further experience has been gained, its employment should be restricted to staircases, corridors, latrines, and stables. For yards, the 40-litre burner should be used, or even the 85-litre, according to circumstances. In riding-schools, the latter burner or the next should be adopted. Generally speaking, the T-shaped fittings formerly employed with batswing burners are utilized. If in a school 200 feet long and about 70 feet wide there are fourteen of these fittings, two 85-litre burners should be placed on each, which will give a total illuminating power of 140 carcels, or rather more than 1300 English candles. This is within the limits admitted as suitable. Possibly employment of the 150-litre burner may be practicable in riding-schools, notwithstanding the relative fragility of its mantle. Its great efficiency would effect much saving of gas. In all other places than staircases, corridors, latrines, and stables, the best incandescent burner is the 40-litre. It might also be employed for corridors, with an increase in the distance between the burners. In a corridor 200 feet long, a single burner at each extremity furnishes enough light for walking purposes.

The heights previously indicated for the placing of burners in the various parts of the barracks must be carefully observed with incandescent burners, as mantles are very easily broken. Generally speaking, these burners do not yield good results in the following instances: (1) With pipes in bad condition, giving very feeble pressures; (2) in yards or corridors where there are strong currents of air; or (3) when suspended from ceilings which vibrate a great deal, placed against thin partitions, or supported by knee-pieces. Of course, there are some specially constructed appliances to overcome these difficulties—such as anti-vibration springs, &c.; but, owing to the extra trouble they involve, they should only be adopted in each particular case when experiments with some of the burners have given perfect satisfaction.

The quality of the mantles is a very important point for consideration. Those of small dimensions are more resisting than large ones; and this is another reason for adopting burners with low consumption, such as those of 25 and 40 litres capacity. In barracks, incandescent burners must always be protected against wind and dust. When they are not enclosed in a lantern or globe, this protection is obtained by a burner shield on the air inlets, and a smoke-consuming baffle device supported by the chimney itself. The glass should be smooth, not fluted; the latter kind being troublesome to clean. With the incandescent system of lighting, more than with any other, it is essential to entrust the management of the burners exclusively to a few careful men who are rarely changed, and are under the direct orders of the quartermaster. They can be instructed by a representative of the company supplying the burners, or by soldiers who preceded them in this work. Moreover, some general rules are given to them, to the following effect: Lighting may be done from the top or bottom, according to the arrangement of the apparatus. When from the bottom, care must be taken to avoid shaking the mantle support by the slight explosion of gas. This point, however, is not of such importance as it formerly was; mantles now being stouter, and the gas generally ignitable from above. Burners with protectors and B B burners must always be lit from above. It is essential to ascertain that the gas has not ignited at the base of the mixing-tube. An indication of this is the small amount of light produced. If the burner were allowed to work under such conditions, it would rapidly deteriorate. As a rule, all that is needed is to shut and immediately open the cock. If this does not give the desired result, the gas should be turned off, and, after a few moments, to allow of cooling, the cock opened fully, and the gas ignited. In riding-schools, where the escape of a small quantity of gas does not cause inconvenience, one of the best systems of lighting is to open all the taps, and regulate the inflow of the gas by a cock at the entrance to the school. The lamplighter then rapidly passes his torch over each burner, and lights it.

The maintenance of incandescent burners consists chiefly in thoroughly cleansing all the parts whenever a new mantle is applied. When the contractor does not give a new chimney-holder with the mantle (which the purchaser should endeavour to obtain), the head of the old one should be cleaned with a little brush. With regard to the burner itself, it should be unscrewed, and the gas and air inlet holes cleared by blowing through them. If pricking is necessary, bristles should be employed, and not metal objects, which might alter the shape of the holes. In the case of riding-school burners, which are particularly exposed to the dust, the outside of the glass should be wiped with a dry cloth once a week. During the period of the year when the gas is not lit, the apparatus should be protected against dust by means of a textile wrapper. About four mantles and two glasses per burner per annum should suffice in barracks for well-installed and well-maintained burners, when the men have been instructed in this mode of lighting. Regulators are generally dispensed with in the case of incandescent burners—not that they are useless, but because variations in pressure have much less influence on the consumption of these burners than on batswings. There may, however, be cases where the pipe is subjected to sudden increases of pressure frequently repeated, which causes rapid wear of mantles. A general regulator is then employed.

STREET LIGHTING IN AUCKLAND (N.Z.).

During several weeks past, Mr. Chenery Suggate, Assoc.M.Inst.C.E., the Engineer of the Auckland (N.Z.) Gas Company, Limited, has been in this country, for the purpose of making personal acquaintance with latter-day improvements in gas plant and appliances and the experiences with them in practice. In pursuing his investigations, he has visited, we believe, about

thirty gas-works in this country and on the Continent, and made new friendships among the engineers and managers of those works, and of many others, too, at recent Association meetings. He is leaving England to-day, with the object of making a tour in the United States on his way home, to inquire into the latest methods there. As a result of all this, he will have a voluminous report to present to his Directors on his return; and it is a certainty that the result will be of vast importance to the Auckland Company and to the community they serve.

Before leaving, Mr. Suggate showed us the accompanying photograph of what he has recently been doing in the way of giving Auckland more light in the principal square, and in order to meet the requirement of the Local Authority for something more imposing than the existing lamps in that particular situation, which embraces the railway station. The form of lamp he adopted will be of interest. Mr. Suggate does not claim that it is anything worthy of much attention. The columns were all built up at the gas-works from material in store, but with the supporting scoll at the top, and the depending light (which is of the Lucas type), the result, though unpretentious in design, is striking. There are eight of these lamps in the square; and their height will be gauged from that of the ordinary lamp standing at the time the photograph was taken in proximity to the one shown.

The Parliamentary Sub-Committee of the Manchester Corporation recommend that a Bill, to be called the Manchester Corporation (General Powers) Bill, 1904, should be promoted in the next session of Parliament. Among the objects to be sought is the construction of further works in connection with the Thirlmere water undertaking.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Machinery at the Walsall Gas-Works.

SIR,—Mr. Smith's figures which you publish this week, of the saving effected in emptying and filling his purifiers at Walsall, due to the machinery he has installed, are interesting; but they are not sufficient for one to judge whether the saving warrants the outlay. Will Mr. Smith kindly tell us, through the medium of the "JOURNAL": (1) What was the initial cost of the machinery? (2) How many boxes a year are emptied and filled?

After the courteous and kindly treatment we received from Mr. Smith on the occasion of the visit of the Midland Association last week, I hardly like to criticize his work in modernizing the Walsall Gas-Works; yet I must admit that, though I admired most I saw at the visit, I felt a strong doubt whether the saving effected by the use of the machinery we saw for emptying and filling the purifiers could warrant the outlay incurred.

The fact should not be lost sight of that, with purifiers of fair size, changes are seldom necessary as often as twice a week on the average throughout the year; and, therefore, when machinery is used, it must be idle at least two-thirds of the year. Another point to consider is the one of depreciation. An allowance for interest and sinking fund is not sufficient. In 20 years this class of machinery will be antiquated—very possibly replaced by more modern plant; and at least 5 per cent. should therefore be allowed for depreciation.

In the case of stoking machinery, it has always been my custom to allow 10 per cent. depreciation before reckoning any saving; and, personally, I should advise this figure for conveyors as well.

If, however, Mr. Smith will kindly give the figures asked for, we shall have the data necessary to decide the doubt I have expressed.

FLETCHER W. STEVENSON.

Coventry, Oct. 30, 1903.

The Manchester Institution and the Crystal Palace Gas Exhibition.

SIR,—Referring to your paragraph, *re* the Crystal Palace Exhibition, I beg to point out that, while not withdrawing from the position of "Patrons," the decision of the Institution of Gas Engineers very considerably modifies the whole case, and this Institution now occupies the unique position of being the only supporters of the Crystal Palace Company. In point of membership, we are the strongest of the District Associations; but we have neither the power nor the opportunity of exercising much influence among the gas engineering or gas apparatus firms, and being so far away from the scene of operations makes it impossible for either our officers or members to take any active part in the conduct of the Exhibition, its working or awards.

As your correspondent Mr. C. E. Ryder Terry says, "Where there's a will there's a way;" and I personally think that two months is ample time to get an exhibit ready. It is not necessary to show the article in a much more highly finished condition than that in which it is sold to the public, but as near as possible in the same state. If this were the case as a general rule, I rather fancy that more business would be done in the future as a result of exhibitions than in the past. I can easily understand a manufacturer wishing to make his exhibits look as attractive as possible; but there should be more agreement between the finish of what some firms show and what they supply in the ordinary course of business.

The Manchester Institution wishes the Crystal Palace Gas Exhibition every success, and will support it as much as possible in the terms of the resolution you printed in your last issue; and I have not the slightest doubt that a very considerable section of our members will visit the Exhibition when it is opened. But to "tout" for exhibitors, we cannot do it—first, because of our geographical position; secondly, as managers of gas-works, in the busy season we have not the time, even if we had the inclination. The Institution of Gas Engineers, having permanent offices and officials in London, is the body to take up such duties—representing as it does the industry in Great Britain and Ireland, not as we do only a few counties.

H. KENDRICK, Hon. Sec.,
Manchester District Institution of Gas Engineers.

Stretford, Oct. 31, 1903.

The New Test-Burner for Derby Gas.

SIR,—My attention has been called to the comments, by "Critic," in last week's "JOURNAL," on the Derby Gas Act, 1903, on clause 54*b*, in which the "Wandsworth" burner is specified as the official burner to be used for testing when the new Act comes into operation.

It may elucidate matters if the clauses relating to quality and testing of gas—section 54 *a* to *d*—which come under the severe strictures of your critic, are given, so that your readers may judge of the value to be placed upon his criticism:—

SECTION 54.

(*a*) The prescribed number of candles shall be fourteen.
(*b*) The prescribed burner shall be Sugg's standard argand burner for 14-candle gas (commonly known as "The Wandsworth Test Burner"), with a six-inch by one-and-five-eighths inch glass chimney.
(*c*) For the purpose of ascertaining the illuminating power, the gas shall be burned at such a rate as to yield the maximum light for which the burner for the time being used in making such tests shall be designed.
(*d*) The standard used shall be Harcourt's ten-candle pentane lamp, with table photometer.

The clauses quoted were drafted by Sir George Livesey and Mr. Charles Hunt, in the interests of the Derby Gas Company, and accepted by Mr. H. E. Jones, on behalf of the Corporation; and it is hardly likely these three eminent experts, whose experience of gas testing is wide and varied, would acquiesce in so important a clause being inserted in a Private Bill which merits the uncalled-for description of "absolute nonsense," and "which cannot be fulfilled or even used with advantage to the Company."

It may perhaps surprise your critic to know that this clause was the subject of much thought and careful consideration on the part of the advisers of the Company; and only after ascertaining the results of a number of tests was it decided on our part to ask for the "Wandsworth" burner, which is a suitable one for testing 14-candle gas.

If we decide to lower our standard to 14 candles next year—which, by the way, means 15-candle gas sent out from the works, so as to be well above the standard at the official testing-station, 2½ miles from our largest works—we object to have this gas tested in a manner which will not correctly record its actual value, but unduly depreciate its illuminating power. Hence the alteration in the burner and method of testing.

J. FERGUSON BELL.

Derby, Oct. 31, 1903.

Gas-Heating Appliances in the States.

SIR,—In connection with your criticism of my article in "Cassier's Magazine," I desire to say that it was written solely with reference to conditions in the United States. As compared with England, our climate is much more severe; and most of the houses are provided with a central source of heat, situated in the basement. This is usually a hot-air furnace, though there are many steam and hot-water generators. For several winter months it would be out of the question to depend upon open fires—whether coal or gas—to heat room temperatures up to the 65° or 70° usually thought desirable.

These facts make the cost-side of heating by gas more important with us than with you. To the house builder here, the installation of gas-pipes means an additional expense for flues, and perhaps separate chimneys, instead of being, as with you, a question whether a coal-grate or a gas-grate be placed. None but the rich could banish coal entirely, and then only through the gas-furnace. The number of days in the year in which artificial heat is needed during every hour, and the quantity of such heat required, make the use of gas at our price out of the question in many situations, where in England the margin between gas and coal costs would be so slight that the convenience of the former would make converts of all users. Again, not only does our gas cost more than yours, but also the coal (anthracite) used in the eastern half of this country is clean and smokeless, and possesses few of the objectionable features of bituminous.

Therefore, in view of our colder climate, hotter rooms, dearer gas, and better coal, I think you err in criticizing my article from an English standpoint. I grant that, in view of the international circulation of "Cassier's Magazine," a statement limiting my article to the United States would have been advisable.

In regard to information upon the retention of heating and cooking business secured by reason of our coal strike, I believe that gas sales this fall are almost universally as large as, and in many cases larger than, for the corresponding months of last year. This fact, in conjunction with another—viz., that gas-range sales have been very good—indicates that the cooking business obtained by reason of the coal strike has been retained, and the satisfaction given by the ranges has made the obtaining of additional business easy. Apparently, however, the maximum rate of output in any day is not as high now as it was last year; and this indicates, as was indeed expected, that, with a normal coal supply, the usual autumn substitution of coal-range for gas-range is occurring at about the customary time. It is also probable that most of the heating business gained because of the strike has been lost, though it is yet too early to be positive of this.

WALTON FORSTALL.

Philadelphia, U.S.A., Oct. 16, 1903.

New Offices for the Bristol Gas Company.—The Bristol Gas Company's offices are shortly to be removed, and the staff will be housed in an imposing building in the very heart of the city. A block of freehold property at St. Augustine's, facing the centre for the tramways, and having a depth of 130 feet, has been purchased by the Company, and the work of erection will be commenced as soon as the ground has been cleared. The building now occupied by the Company in Canon's Marsh will be superseded by one more up to date; and it is intended to utilize a considerable amount of space for show-rooms, &c. This step has been taken in consequence of the enormous growth of the Company's business, and the site selected, being so easily accessible from all parts of the city, will prove eminently suitable not only for them, but for the public generally.

Reductions in Price.—The Larkhall Gas Company, Limited, have reduced the price of gas from 3s. 4d. to 3s. 1½d. per 1000 cubic feet. The Directors of the Kingston-upon-Thames Gas Company have decided to reduce the price of gas from 3s. to 2s. 10d. per 1000 cubic feet as from the 1st of January next. The Driffield District Council have reduced the price of gas from 3s. 7d. to 3s. 4d. per 1000 cubic feet. The Wandsworth and Putney Gas Company announce that, after the taking of the meter-indices at Christmas, the price of gas will be reduced from 2s. 4d. to 2s. 2d. per 1000 cubic feet. The output of gas last quarter showed an increase of just over 7 per cent. The Elland Gas Company have decided to reduce the price of gas by 3d. per 1000 cubic feet as from the beginning of next year. This will make the charge to ordinary consumers 2s. 6d. per 1000 cubic feet, and to large users 2s. and 1s. 9d., according to quantity. With this reduction, the Company are entitled to declare an increased dividend on their old ordinary stock to the extent of £177, raising it from 6⅝ to 7¼ per cent. At Ripon, a reduction is announced in the price of gas from 3s. 9d. to 3s. 4d. per 1000 feet.

MISCELLANEOUS NEWS.

COMPLIMENTARY DINNER TO MR. JOHN W. FIELD.

Mr. J. W. Field, upon the occasion of his retirement from the post of Secretary and General Manager of the Gaslight and Coke Company, was, on Thursday evening last, entertained at a complimentary dinner at the Princes' Restaurant, by the Directors, chief officers, and officials. Colonel Sir William T. Makins, Bart., the Governor of the Company, presided. There were also present Sir John Aird (a former Director), Sir R. Giffen, the Official Auditor, Mr. Harvey, representing Messrs. Glyn, Mills, Currie, and Co., Mr. Monier-Williams, the solicitor, and others.

After the toast of "The King," the Chairman proposed that of "The guest of the evening." In the first place, he reminded his hearers that the Company was formed in 1810; and that in 1812, it received its Charter of Incorporation. From this date, with more or less success (he ventured to think with more rather than with less), it had carried on its work for the benefit of the population of this, the largest city in the world. Mr. Field had passed by far the greater part of his life in the service of the Company; and for the last ten years he had occupied the highest place of all. The post of Chief Officer of such a Company as theirs was, of course, a position of very great importance. The Chairman referred to Mr. Field's well-known objection to what he would describe as the "Teapot testimonial." A far more valuable possession was the knowledge that he (Mr. Field) had done his duty, and had obtained the approbation of those with whom he had served. The past ten years had been years of arduous work—the greater part of them years of storm and stress and adverse criticism, which had placed more than ordinary strain upon both the Court and Executive of the Company; and, although all could have wished that Mr. Field's services might have lasted a few years longer, no doubt he was well advised to spend the remainder of his life in comfort and, if possible, without loss of health. The object of the present gathering was to express regret at the retirement of Mr. Field, and to assure him how greatly his services to the Company were appreciated. After referring to Mr. Field's kindly relations with the staff, Sir William proceeded to pay high personal tribute to both Mr. Field and his predecessor (the late Mr. J. Orwell Phillips) for the support they had always afforded him, and to express the debt of gratitude which he owed to them. He was, however, happy to say that Mr. Field's great experience and knowledge would be retained for the benefit of the Company, as he was to take the seat at the Board vacated by Mr. J. B. Paddon (whom they were truly sorry to lose, and whose absence that night, through indisposition, they particularly regretted). He was sure every member of the Board looked forward to being associated with Mr. Field at the Court. He gave them the toast of "The late General Manager and the new Director," and might health and happiness follow him in his retirement.

Mr. Field, in reply, stated that it was no mere *facon de parler* to say that the present was the proudest moment of his life. He was deeply indebted to Sir William Makins for the very kind and flattering terms in which he had referred to his (the speaker's) services during the past thirty years. His next duty was to thank the company present for their attendance that night. He saw there, not only his late colleagues, but gentlemen representing those wider interests, and those higher authorities with which a Company of this kind was necessarily associated. He was exceedingly obliged to them for honouring him with their presence. He wished to thank the members of the Court for the many marks of their favour shown him upon his retirement—the greatest being the honour conferred upon him of electing him a member of the Court. He hoped that, with the assistance of his new colleagues, he should do no injustice to their selection. Looking back upon his life's work, he was conscious of having done things which might have been better done, and done with more consideration for those around him. He quite realized that his colleagues had been most patient with him, that the interest they had taken in the Company had enabled them to overlook matters of personal consideration and to work together, as he believed they had done, for the Company's benefit. He would now address a few observations to members of the staff—especially the junior members. They were told that a country's future would be very much what the rising generation made it. It was, therefore, with the younger members that the future of the Company rested. They started with two advantages—first the probability of a long working life; and, secondly, (and this advantage could not be exaggerated), the existence of competition. The old school had been unfortunate in having received their training in times of very great prosperity; and there was no more deadening influence on a man than the fact that he could do very much as he liked and could take things very much as they were. His (Mr. Field's) thanks were due to the staff for their devotion to him, for never having failed to afford him all the assistance in their power to relieve him of any undue burden of work. To the Directors, he was under very great obligations for their forbearance, their support, consideration, and oft-repeated expressions of appreciation of his services. To Sir William Makins he wished to express his obligations for invariable kindness and courtesy; for help in every possible way during the past ten years of the Company's history, without which it would have been impossible to perform the duties of General Manager with any degree of success. He prayed that Sir William might be spared for many years to preside over the Court, encourage the staff, and promote the best interests of the Company. [Loud applause.]

Sir John Aird proposed the health of the Chairman; and the Deputy-Governor (Mr. Howard Charles Ward) proposed the toast of "Prosperity to the Gaslight and Coke Company."

GAS COMPANIES' PROTECTION ASSOCIATION.

The Sixth Annual General Meeting of the Association was held on Friday, at the Westminster Palace Hotel. The subscribers were represented by the following: Messrs. T. Berridge (Leamington), C. E. Botley (Hastings), C. W. Braine (Wandsworth and Putney), George Clarry (Cardiff), W. R. Cooper (Banbury), H. Hart (Canterbury), H. E. Jones (Commercial Gas Company), R. S. Keys (West Kent), W. King (Liverpool), C. M. Ohren (Crystal Palace Gas Company), W. R. Phillips (Hitchin), J. T. Randall (Tottenham and Edmonton), A. G. Readdy (Hoylake), Sydney J. Shoubridge (Crystal Palace District Gas Company), and A. G. Snelgrove (West Ham).

At the commencement of the proceedings,

Mr. C. E. Botley moved, and Mr. A. G. Snelgrove seconded, that Mr. H. E. Jones be asked to occupy the chair. This was agreed to; and

Mr. Jones having assented, the business was at once taken in hand.

The Secretary (Mr. F. E. Cooper) read the minutes of the fifth annual meeting, held on Oct. 30, 1902; and subsequently the

Annual Report and Accounts.

The former was as follows:—

The Committee have pleasure in presenting their report of the proceedings carried on by the Association during the past year.

In accordance with the instructions of the Committee, the Secretary, in the month of November last, sent out to all gas companies, whether members of the Association or not, affected by applications for Electric Lighting Provisional Orders in the then ensuing session, a circular, calling attention to the clause (known as the "Bermondsey Clause") which was inserted in the Bermondsey and other Electric Light Orders in the session of 1902.

In consequence of the issue of this circular, several gas companies took the necessary steps to secure the insertion of a similar clause in Provisional Orders promoted by local authorities. The Board of Trade declined to insert the clause in such Orders—it is believed in all cases; but some of the gas companies affected petitioned Parliament against the confirmation of Orders affecting them, with the result that, in some cases, such clause was inserted. The Committee strongly urge all gas companies to endeavour to secure the insertion of the clause in question in all future Orders promoted by local authorities.

The Committee are pleased to say that the Government did not this session re-introduce into Parliament the Gas Regulation Bill, which was brought in in the autumn session of 1902. In view of the fact that it was expected the Bill would be proceeded with this session, the Secretary obtained from various gas companies and local authorities owning gas-works and manufacturing carburetted water gas information which will be of much assistance to the Committee for use at the interview which the Board of Trade have promised to give the Association before the Bill is re-introduced into Parliament.

The only Bills affecting gas companies' interests introduced into Parliament last session were the Borough Funds Bill, the Steam Engines and Boilers (Persons in Charge) Bill, and the Petroleum Bill. The first mentioned, being a Government Bill, the Committee were, despite their efforts, unable to do more than secure the insertion therein of some important amendments. The other two Bills, however, were blocked; and they were accordingly not proceeded with.

As in past years, the Association has been consulted by many companies with reference to matters of a varied character arising in the conduct of their undertakings. Among other matters upon which the Secretary has given advice may be mentioned the following: (1) Necessity of gas companies obtaining licence for storing benzol. (2) Legality of free supply of electricity for temporary periods by a local authority. (3) Injury to gas mains and pipes by steam-rollers. (4) Right of local authority to pave roads not hitherto paved at cost of rates, and liability of local authority for leakage of gas caused in executing such work. (5) Various questions affecting gas companies in connection with demands for the payment of income-tax. (6) Electrolysis. (7) Agreements for supply of gas for public lighting. (8) Legality of discounts to consumers of gas supplied for motive power. (9) Interference with gas mains and pipes in laying electric light wires. (10) Liability of the gas companies for damage caused by escape of gas. (11) Liability of mortgagees in possession for gas supplied to mortgagor. (12) Stealing money from slot-meters. (13) Deposit to be made by intending consumer under section 16 of the Gas-Works Clauses Act, 1871. (14) Applicability of the provisions of the Factories and Workshops Act, 1878, as to lime-washing retort-houses. (15) Transfer clauses in Electric Lighting Provisional Orders. (16) Resort to rates by local authorities in aid of electric light undertakings.

The Association is recognized as being usefully engaged for the protection of the interests of gas companies; and the Committee desire to urge upon all gas companies the importance of their becoming members. The present number of members is 86; and among that number are some of the largest, and also some of the smallest, companies in Great Britain and Ireland.

It is with the greatest regret that the Committee have to announce that Sir George Livesey, who has been Chairman of the Committee since the inception of the Association, has resigned his position, as he feels that the time has arrived when he must decrease his labours. The Committee desire to place on record their keen appreciation of the great assistance Sir George has been to the Association.

The following gentlemen retire from the Committee in pursuance of No. 9 of the Association's rules, all of whom offer themselves for re-election: Mr. Thornton Andrews (Swansea Gaslight Company), Mr. C. E. Botley (Hastings and St. Leonards Gas Company), Mr. H. B. Chamberlain (British Gaslight Company), Mr. G. Clarry (Cardiff Gaslight and Coke Company), Mr. J. W. Helps (Croydon Commercial Gas and Coke Company), Mr. R. O. Paterson (Cheltenham Gaslight and Coke Company). There is also a vacancy on the Committee in the place of Sir George Livesey.

The Secretary has received notice from Mr. Keys, the Secretary of the West Kent Gas Company, of his intention to propose Mr. James Randall, of the Tottenham and Edmonton Gaslight and Coke Company, as a member of the Committee.

The Chairman said, in the absence of those more influentially connected with gas than he was, thanks to the kind wish of those present that he should take the chair, it was his duty to move the adoption and entry upon the minutes of the report and accounts. The year had not been a very eventful one; and perhaps that was the reason why there was rather a small attendance on this occasion. There was no very

burning question before them; and there was no very immediate prospect of any parliamentary difficulties affecting gas companies generally. The report, he saw, mentioned the Gas Regulation Bill, which, he thought, they might consider as dead—at any rate, while the whole of the country was being ramped by the discussion of the fiscal question, they were not likely to have any discussion over this Bill. The report stated at length a number of very useful works, though not strikingly imposing, which the Association had carried out for the benefit of the smaller companies. As to the Borough Funds Bill, he thought they might depend upon it that the inquiry that had lately been devoted, first of all, to the question of the wisdom of local authorities undertaking the enormously varied number of enterprises that they did, and, secondly, to the matter of those enterprises being properly audited and accounted for, would go a long way towards stopping the abuse of any powers which municipal authorities had possessed in the past for getting funds for the purpose of fighting the gas industry without the proper authority of their constituents. He was sure they would soon see a very decided reticence on the part of local authorities to engage either in extensive hostilities to the processes of companies or, especially, he thought, to opposing them with the view of annexing their property. The rest of the subjects touched upon were, as he remarked before, all very interesting as matters arising in the domestic administration of small companies, and for which they must naturally look to an Association like this. He should have a resolution to propose of his own, for extending the usefulness of the Association, because he thought they certainly ought to have a larger number of members than 86 out of the Gas Companies of the kingdom. It was quite clear, though there were some of the smaller companies among the 86, there must be a large number of such companies who either did not know the value of the Association or did not appreciate it at the amount of 2 guineas, which was the subscription. There was one sentence in the circular notice of the meeting which showed that there was a vacancy on the Committee owing to the retirement of Mr. R. O. Paterson. Mr. Paterson did say something about this at the last meeting of the Committee, but he withdrew it; and so, as Mr. Paterson again offered himself for re-election, the six vacancies on the Committee would, if the meeting thought fit to re-elect those retiring, be provided for. If it was the feeling (of course the meeting might take a different view) that the old members should be re-elected, this would debar them from proceeding with Mr. Key's notice of motion. Had Mr. Key's notice been carried out, it would have given them an extremely welcome addition to the Committee; and he hoped to see the day when Mr. Randall would be on the Committee. The other point he had to refer to was the resignation of their late Chairman—Sir George Livesey; and he was sure the members would all concur with the Committee in the resolution which had been communicated by them to Sir George. He was certain the members generally would not like this occasion to pass without approving the resolution of their regret that he was no longer able to serve them—that he was no longer able to give the time in the capacity in which he had so ably and sincerely served them, to the great advantage of the Association. But there remained a means of continuing the connection of his name with their proceedings in their rules and prints; and that was, by asking him to accept the vice-presidency of the Association. They had at present as President, Mr. Henry Kimber, M.P.; and it was desirable their President should be in Parliament. But they had this opportunity open to them of asking Sir George Livesey to serve them in the office of Vice-President, which would not demand from him attendance at the meetings of the Committee, and so would not draw upon his leisure. He was sure the members would all sympathize with this, and agree to the resolution. The accounts were also before them; and it appeared from them that the balance at the bank and in hand last year was £346; and they had now a balance of £353, although they had invested £186 13s. 6d. of the old balance. It would be seen from this that the Committee would be in a position to shortly make a further investment. He thought that this was very satisfactory, and that the members would think so too. He believed that all the members—there might be an exception or two—had paid their subscriptions; and the Committee had not in any way overspent their funds.

Mr. J. T. RANDALL seconded the motion, which was unanimously agreed to.

The Late Chairman.

The CHAIRMAN said his next proposal was that they elect Sir George Livesey as Vice-President of the Association, and so create a new office for the purpose, although it was not contemplated in the rules.

Mr. T. BERRIDGE seconded the motion, in which all the members heartily acquiesced.

The CHAIRMAN suggested that, in communicating the election to Sir George, they should express the regret of the meeting that he could not continue to serve them as hitherto, and to thank him for his efforts in the chair during the years the Association had been in existence. He formally moved a resolution to that effect.

Alderman HART remarked that he was very pleased to second the resolution, because he considered the members were largely indebted to Sir George for his exertions. On every occasion that he (Alderman Hart) had been present at the meetings, Sir George had occupied the chair; and the able addresses and advice he had given to the members entitled him to their greatest encomiums. He was confident he was only speaking the sentiments of all present and of those who were absent. There was no gentleman connected with the gas industry who had a better acquaintance with or knowledge of the work of gas companies than their late Chairman; and he (the speaker) hoped that the letter to be sent to Sir George would be put in such language that he would accept it—not merely as a formal vote, but as the expression of their heartfelt thanks for his services to the Association.

The resolution was unanimously carried.

Committee Elections.

The CHAIRMAN said the next thing was to proceed with the election of members for the Committee. The Committee had felt that they should not lose the representation of the South Metropolitan Gas Company, because they were their largest subscribers—25 guineas he believed was their subscription; and therefore they had come to the conclusion to propose that Mr. Frank Bush, the Secretary of the Company, should be elected to fill the vacancy caused by the retirement of Sir George Livesey.

Mr. A. G. SNELGROVE seconded the motion, which was cordially passed.

The CHAIRMAN said it now remained for them to consider the re-election of the six retiring members of the Committee. He did not know whether Mr. Randall or his nominator would like to say anything on the subject.

Mr. KEYS observed that the reason he nominated Mr. Randall was because it was mentioned in the notice of meeting that Mr. Paterson had retired. He was glad to find that Mr. Paterson had seen his way to continue to serve the Association.

Mr. BERRIDGE asked if it was necessary to nominate anybody. There was nothing in the rules about it; and therefore he thought the clause in the notice calling the meeting was misleading, and ought not to appear. It said: "Members of the Association desiring to nominate any gentlemen to serve upon the Committee are invited to forward such nomination to the Secretary on or before the 24th inst."

The SECRETARY said he thought Mr. Berridge would find that was in accordance with the rules.

The CHAIRMAN remarked that there was an obvious convenience in having the names submitted before the meeting; but as Mr. Randall's nominator kindly fell in with the suggestion that was made to him, the question did not arise.

Mr. RANDALL proposed *en bloc* the re-election of the retiring members of the Committee. [The names are given in the report.]

Mr. BERRIDGE, in seconding, said he hoped it would not always be necessary to re-elect the members of the Committee. He did not want the Association to become a close borough, and to be represented by the same men on every occasion.

The CHAIRMAN pointed out that the Committee were selected pretty widely over the country. The Sub-Committee had always felt very anxious that there should be nothing like a close borough, or a monopoly of the representation, just because gentlemen happened to be conveniently placed near to London to attend the meetings. But if the members examined the constitution of the Committee, and especially the names of the gentlemen who came up for re-election, they would find they were broadly scattered over the country. Mr. Helps came from Croydon; but that was far enough away. Then they had Swansea, Hastings, the British Gaslight Company, Cardiff, and Cheltenham, represented by the gentlemen up for re-election; so that it would be seen they had their Committee spread well over the country. As a matter of fact, he (the Chairman) did not specially represent the Commercial Gas Company, any more than he did the Eastbourne Company, because they, too, were subscribers. Looking to the enormous amount of business done by the Metropolitan Companies, he did not think their representation by Sir William Makins and Mr. Bush would be out of the way.

The motion was then unanimously adopted.

Later in the proceedings,

Mr. BOTLEY said he quite sympathized with the remarks of Mr. Berridge; but he could assure him that the feeling of every member of the Committee was not to occupy the position any longer than was absolutely necessary, if someone else was prepared to take up the duties. The duties were not very severe, but at the same time they required a certain amount of attention; and there was no desire on the part of the members—anyway, he could speak for himself—to occupy the position permanently. He should be very pleased to give way at any future time to any other member, in order to infuse fresh blood into the Association.

Mr. GEORGE CLARRY acknowledged his re-election, and concurred in Mr. Botley's remarks.

An Invitation to Small Companies.

The CHAIRMAN next moved that, in the case of companies with a capital of £10,000 and under, they be admitted into the Association on payment of an annual subscription of one guinea. This was a small amount; but they might be able to coax a guinea out of the small companies where they could not obtain two guineas, and so get them into their ranks.

Alderman HART seconded the proposition because he thought it was desirable they should extend their numbers. They had almost a standstill Association; but he thought that, as trade enlarged, and increased throughout the Empire, they ought to endeavour to enlarge the Association. Whether the guinea subscription would act as a temptation to small companies to come in he did not know. At any rate, he should like to try it. There could be no objection to it. There was everything to gain and nothing to lose by increasing their numbers.

The proposition was agreed to.

The Chairmanship.

The CHAIRMAN said he should like to inform the meeting, having in view the loss of Sir George Livesey as Chairman, that he had written to Sir William Makins, asking to be allowed to have the pleasure of nominating him for the position; but he had replied that he did not feel he could add to his engagements by accepting the kind proposal, although he fully appreciated the honour done him in making the suggestion.

[At the subsequent Committee meeting, on the proposal of Mr. WILLIAM KING, seconded by Mr. C. E. BOTLEY, Mr. H. E. Jones was appointed Chairman of the Association.]

Trade Disputes and Combinations.

The question of the Association giving evidence before the Royal Commission on Trade Disputes and Combinations was also considered; and the Secretary was instructed to forward a circular to the members, calling their attention to the appointment of the Commission, and asking whether they were in a position to give evidence, and were desirous of doing so.

A hearty vote of thanks to the Chairman ended the proceedings.

PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

Portions of the Evidence Abstracted.

Eighth Day—July 16.

The Right Hon. A. G. MURRAY, K.C., M.P.

Evidence with regard to the practice of the Scottish Office in relation to the audit of the accounts of local authorities was given by the Lord Advocate, the Right Hon. Andrew G. Murray. Witness said that the history of the question really began with the Local Government Act of 1889, which was the County Council Act. Prior to this, although there were provisions for the auditing of certain local expenditures, there was, in the proper sense of the word, no general audit of the county accounts. Section 68 of the Act referred to was to the effect that the accounts of the receipts and expenditure of a county council (including those of the district committees) should be signed by such person or officer as the Secretary for Scotland should from time to time prescribe; and the following section provided for the Secretary appointing auditors to audit the accounts of each county. Under this Act, the question of surcharge was in one sense in the hands of both the auditor and the Secretary—that was to say, the Secretary could not surcharge unless there was a special report from the auditor, while, on the other hand, the auditor had not himself the power to surcharge. Therefore, no surcharge was possible unless both the Secretary and the auditor agreed. In 1894, another Local Government Act, generally known as the Parish Councils Act, was passed; and in this also provision was made for audit by simply adopting the sections of the 1889 Act, with the difference that the Local Government Board took the place of the Secretary for Scotland. With regard to the burghs, the Town Councils Act of 1900 provided for the annual appointment of an auditor by the Secretary. The provisions as to surcharge did not follow the lines of the County Acts which he had referred to, because there was no direct machinery for allowing the Secretary to surcharge—he only appointed the auditor. If the auditor found certain things had not been done—such, for instance, as the keeping up of a sinking fund—he had to make a special report. This was exhibited, in a public place, to the ratepayers; and then any ratepayer who was not satisfied might, so to speak, practically take the surcharging function into his own hands by presenting a petition to the Sheriff, in his capacity of Judge. The Sheriff was master of the whole situation—he could do what he thought fit. This was a very simple and inexpensive process for the ratepayer. But, on the other hand, what was everybody's business was nobody's business, and probably when left to the ratepayers there was really less likelihood of surcharging proceedings than if it was left to a public office. The Town Councils Act did not apply to every burgh; some of the larger ones being constituted under Private Acts. The Secretary did not appoint the auditors of five of the very large towns; and there were also some few other burghs who had resisted the application of the Act. There was, however, a very strong feeling—he would not put it further than that—to his knowledge, both in Edinburgh and Glasgow, that it would be better, even in these places, if the auditors were not being chosen by the corporation. In appointing auditors, the Scottish Office adopted two rules—first, that they should be professional men; and, secondly, that in the smaller burghs no man should be elected to audit the accounts of his own town, but all must be free from local influence. It was the practice of their auditors to report as to the proper allocation of items in the accounts; and in this they were greatly assisted by having a prescribed form of account. These reports did not contain a clear statement in words whether a municipal undertaking—such as tramways, or gas or electric lighting—had or had not made a profit during the period under consideration; they were only made if there was anything wrong. The auditors had nothing to do with any question of policy. His private opinion was that it would be desirable for the auditor to append to his report a statement as to whether trading concerns showed a profit or loss to the ratepayers, because it must be wrong if the operations were so covered up by figures that an ordinary person could not really tell if a profit was being made or not. It was exceedingly easy to conceal the true result if a professional person was not investigating the accounts. In the case of very large burghs, he would not suggest that the auditors should necessarily be imported from outside, because it might be an advantage for a man to have local knowledge; and in big places they could obviously get persons of such high character that there was not the slightest danger.

Mr. HENRY ROBERTS, J.P., of Warrington.

The next witness to come before the Committee was Mr. Henry Roberts, J.P., who said he had been twice Mayor of Warrington, but had now retired from the Town Council. He was Chairman of the Warrington Slate Company, which was originally a private concern, but was made into a limited liability company (for purely financial reasons) before he became a member of the Council. The formation of the Company, therefore, had nothing to do with his position as a member of the Municipality; and he objected to the statements made by Mr. Norbury Williams (*ante*, p. 162) as having no justification in fact, so far either as his own conduct was concerned or his relationship to the Corporation through the Company. The firm was in existence for over three years before it was registered as a limited Company; and from the beginning right down to the present day, the business had in a small way supplied, and was still supplying, goods to the Corporation in public competition and in response to advertisements for tenders. The sales made by the Company to the Corporation had not averaged £2000 per annum for the last fourteen years; and this was not one-fiftieth of the business done. On no single occasion when he was a member of the Council did he take any part in the Committees who ordered goods from the Company. The statement made by Mr. Norbury Williams that the Warrington Slate Company was a "colourable" company was false. His further suggestion that it was a one-man company, so formed for the purpose of trading with the Corporation, was equally false; and his assertion that there were several other companies which seemed to him to have been created in order that the shareholders, some of whom were or had been members of the Council, might trade with the Corporation, was utterly devoid of truth. Mr. Norbury Williams had no personal knowledge of Warrington or of Warrington affairs; and the speeches he made during the agitation in the town, which were full to overflowing of the grossest misstatements and exaggeration of facts, proved that he had accepted as true anything said by persons in the town, without taking the slightest trouble to verify what he was told. In 1901, the Auditors of Warrington called attention in their report to certain irregularities which had taken place; and the Council immediately appointed three members to investigate the charges. This Committee found that some of the transactions were not illegal, and that others were capable of satisfactory explanation. The sums involved were small; and in every instance the transactions had been to the advantage of the borough. The charges (which only concerned three members) were, first, that about £28 worth of furniture, though supplied in the name of Messrs. H. & A. Sutton, was really trading done by Alderman Sutton with the Corporation. The second was that a sum of money paid to Mr. Arthur Sutton for professional services in regard to the purchase of some materials was really a sum of money paid to Alderman Sutton for such services. The third was that fuel supplied for gas manufacture, to the amount of some £500, in the name of Mr. Richard Silk, was really supplied by Alderman Francomb. The last charge was that the sum of ten guineas paid to Alderman Shaw Green for services rendered in connection with the purchase of land for water-works extension was a payment that ought not to have been made to him. Demands were now being made for further inquiry, to which the Corporation had not the slightest objection, provided it was conducted on proper lines. If the safeguard of public tender and advertisement was applied, he saw nothing against the supply of goods to a corporation by a company largely owned by a member of the corporation; and he would say the same with regard to a private business, were it not for the fact that the law had made it illegal.

Questioned by Mr. Powell Williams, witness said that £10,000 out of £17,000 of shares in the Slate Company were held by his family, and that if it had been a private concern in his hands no dealings with the Corporation would have been possible during the time he was on the Council. He admitted that, as a member of the Corporation, it would be his duty to see that all purchases were made as cheaply as possible; while, on the other hand, as a Director of the Company, it would be his duty to get as good a price as he could from the Corporation. In this case, however, he would not consider the two positions as in any way conflicting, because he took no part, either as buyer or seller, in the settling of the contracts. The Chairman asked whether it was not obvious to witness that in many cases the mere absence of a member from a committee, if his friends were on it, might be very little safeguard to the interests of the ratepayers. By a practice which in America was known as "log-rolling," this safeguard could be reduced to an absolute minimum. Witness said he quite agreed.

Mr. J. L. WHITTLE, Town Clerk of Warrington.

Exception to portions of the evidence of Mr. Norbury Williams was also taken by Mr. J. L. Whittle, the Town Clerk of the County Borough of Warrington, who said it had been alleged that he had placed obstacles in the way of ratepayers exercising their legal rights under the Municipal Corporations Act to inspect the minutes. He explained that he had refused inspection of the minute-book of a committee, but never those of the Council. His view was that the Act, though it might authorize him to do so, did not oblige him to exhibit the minute-books of a committee to any ratepayer. The circumstances of his refusal were these: In 1901, a burgess demanded to see the minute-book of the Gas Committee. Witness intimated that if he would let him know what it was he wanted to see, he would give him the information. This offer was declined, and the production of the book demanded. This was refused; but he did produce the minutes of the Council, which, as a matter of fact, contained all the proceedings of the Gas Committee which required the approval of the Council. He had himself compared the printed proceedings of the Council with the written minute-book of the Gas Committee, and every resolution without exception that required the confirmation of the Council was printed *in extenso* in the Council's proceedings. The ratepayer then commenced an action in the High Court for a declaration of his right to see the minute-book and for a peremptory writ of mandamus. An interlocutory motion was made to the Court of Appeal for an order for discovery and production of the minute-book; and the Court refused to make the order. He was unable to find out why the man in question particularly wanted to see the minute-book of the Committee; but, in his opinion, it would be dangerous to public policy to allow a burgess to inspect the minutes of a committee.

Mr. ROBERT HYDE, Town Clerk of Stockport.

Mr. Norbury Williams's statements were further responsible for the appearance before the Committee of Mr. Robert Hyde, the Town Clerk of the County Borough of Stockport, who said he attended on his own behalf "to refute the various charges of misconduct made against him." He had never refused, or advised the refusal, to produce or furnish to either a burgess or an elective auditor any book, minute, or document, or other information which he was entitled to require. The charges were apparently made upon information furnished to Mr. Norbury Williams by Mr. Thomas Hunt, one of the Elective Auditors of Stockport, who wished to peruse the whole of the written minutes of the Borough Extension Committee. This was refused; but the printed minutes of committees which had been brought up for confirmation by the Council were placed at his disposal. The decision given in 1897 by the Divisional Court, in the case of *Norbury Williams and Another v. The Manchester Corporation*, was, in witness's opinion, a direct authority against the production of the minutes of committees as such. The decision of the Court was that the burgesses of Manchester were entitled to inspect all the acts of the committees submitted to the Council for approval; and this he had strictly acted upon. The necessity for a strict interpretation of the law had only arisen since the advent of the type of elective auditor which of

recent years had come into existence in some of the northern towns. Their procedure was really not one of audit in the proper sense of the word, but of espionage or inquisition. They did not really audit the accounts, but extracted from the proceedings and documents particular matters, usually of a personal character, which they criticized in a highly captious style in the public Press.

Mr. THOMAS LOFTOS, Town Clerk of Blackpool.

Still another gentleman who felt aggrieved by the evidence of Mr. Norbury Williams was Mr. Thomas Loftos, the Town Clerk of Blackpool, who said it was untrue that he had refused permission to ratepayers to inspect minutes which under the Municipal Corporations Act they were entitled to see. He agreed practically with what had been said on the subject by the previous witness. He had not refused to show any minutes submitted to the Council. What he had declined to produce were the rough notes taken at committee meetings. He certainly thought it desirable that a public body dealing with public money should make their proceedings as public as possible. Mr. Platt-Higgins: "We have had the accounts of the Corporation of Blackpool put in; and in your revenue account (electric light) the gross profit is given as £9192, and the net profit as £58; the gross profit being put in big type, and the net profit in small type. I want to know whether that is in accordance with your advice?" Witness: "It is not in accordance with my advice. I have not noticed it."

Ninth Day—July 20.

Mr. R. R. LINTHORNE, Town Clerk of Southampton.

After Mr. Andrew Murray had been re-called, and had handed in copies of the form of accounts prescribed for use in Scotland, Mr. Richard R. Linthorne, the Town Clerk of Southampton, made a statement with reference to the evidence given by Mr. Tritton (*ante*, p. 109). It was entirely inaccurate to say that the bankers of the Southampton Corporation (the Capital and Counties Bank) had lost money in respect of an overdraft by the Corporation. Not a penny had been lost by them either in respect of an overdraft or anything else. In 1901, the newly added districts of Shirley and Freemantle objected to a rate which was levied; and proceedings were taken before the Recorder at Quarter Sessions. In order to ensure their obtaining the costs of the proceedings, the added areas included all possible grounds of appeal, one of which was the inclusion in the rate of certain overdrafts at the bank over six months old, and of interest thereon. Their leading Counsel distinctly stated that his clients had no intention of preventing the bank being paid, but that for the purposes of the appeal the point they had taken was fatal to the rate. The Recorder, in quashing the rate, said, in his considered judgment, that it was not suggested that the liabilities of the Corporation, however incurred, were not to be met. A large portion of the overdraft was in respect of excess expenditure on works which had been authorized by the Local Government Board; and they had to go to them again to sanction this excess expenditure. Therefore Mr. Tritton's statement was so far accurate that, although the money was not lost, it could not be paid as they stood at the time. All the money had been spent on useful work; and there was no question of misappropriation or anything of the kind. At the time the rate was quashed, the Corporation had a large overdraft at their bankers, in respect of £135,000 of which they held a consent order of the Local Government Board to issue stock; but they refrained from doing so as the Money Market was against them. When an issue of stock was made, the proceeds were applied in reduction of the overdraft. Subsequently, the Local Government Board sanctioned, with a few trifling exceptions, the whole of the sum which then remained overdrawn. One or two of the exceptions referred to were deficits on the working of the electricity undertaking, which had been carried to suspense account rather than charged to the rates, because it was felt the concern would pay in time. Fortunately, it was now paying; and the items had been defrayed out of profits. When he said the deficits had been carried to a suspense account, of course he meant that they had borrowed money from the bankers to pay them. Asked what he considered was the actual security of the bank for the overdraft, witness said they could have closed the account and sued the Corporation on it. They had a very large freehold estate in the town; and the bank could have had a Receiver in respect of the rents. The Finance Committee considered Mr. Tritton's evidence a slur upon the borough, because there was, of course, no suggestion that the money would never be paid.

This concluded the evidence taken by the Committee, the substance of whose report was given in the "JOURNAL" for Aug. 11 (p. 357).

The Strike of Workmen in Barcelona.—According to a Reuter's telegram sent from Barcelona on the 29th ult., the result of the strike of the employees at the gas-works mentioned last week, is that 15,000 men engaged in other industries are idle.

The Electric Lighting Muddle in Marylebone.—At a meeting of the Marylebone Borough Council last Thursday—the Mayor (Alderman G. J. Elgood) presiding—the question of the expediency of promoting next session a Bill for amending the Electric Lighting Order Confirmation (No. 1) Act, 1901, was specially considered. Mr. Ernest R. Debenham, the Chairman of the Electric Supply Committee, moved a resolution stating, among other points, that it was expedient to promote a Bill next session to empower the Borough Council to borrow the necessary money for the purchase of the Marylebone business of the Metropolitan Electric Supply Company, Limited, and for the erection of electricity works, to authorize an increase in the maximum charge for the supply of electricity, and to alter the method of charging. Power will also be sought to erect generating stations in the district, and generally to make arrangements to carry on the undertaking. The motion was carried on a division by 43 votes to 8. In the course of the discussion, Sir Edwin Galsworthy strenuously opposed the scheme, and said the Council were not compelled to go for an Act of Parliament, nor was there any need for it. By a second resolution, which was also carried, the Town Clerk was directed to take all necessary steps in connection with the proposed Bill.

METROPOLITAN WATER ARBITRATION.

Second Day—Monday, Oct. 26.

(*Before the Right Hon. Sir* EDWARD FRY, *Sir* HUGH OWEN, G.C.B., *and Sir* JOHN WOLFE-BARRY, K.C.B.)

The second public sitting of the Court of Arbitration, constituted as above, appointed under the Metropolis Water Act, 1902, to adjudicate upon the claims made by the Metropolitan Water Companies in respect of the transfer of their undertakings to the Metropolitan Water Board, was held on Monday last week in the Hall of the Institution of Mechanical Engineers, Storey's Gate, Westminster.

The first sitting was held on the 29th of May, when the claims sent in by the Companies and by the Tottenham and Enfield Urban District Councils were ordered to be amended, and certain preliminaries were settled. The Court adjourned until the 26th ult., when it was decided to take the case of the East London Water Company first. At the opening of the proceedings, there was a large attendance of representatives of the Companies, but only a few members of the Water Board. The original claims of the Companies, amounting in the aggregate to nearly £50,000,000, in addition to their debenture stocks, were as follows: New River, a sufficient amount of stock to produce £350,000 per annum, calculated on a 3 per cent. basis, or £11,550,000; East London, £7,204,144; Grand Junction, £4,830,000; West Middlesex, £4,200,240; Lambeth, £5,511,342; Southwark and Vauxhall, £5,674,140; Chelsea, £4,750,000; and Kent, £3,715,514. Against these amounts the Water Board have made the following offers: New River, £3,000,000; Grand Junction, £1,500,000; West Middlesex, £1,500,000; Lambeth, £1,000,000; Chelsea, £1,750,000; Kent, £1,500,000—or a total for six Companies (no offers having been made in the cases of the East London and Southwark and Vauxhall Companies) of £10,250,000.

The following Counsel appeared for the Companies: Mr. BALFOUR BROWNE, K.C., Mr. C. A. CRIPPS, K.C., M.P., Mr. C. BAGGALLAY, K.C., Sir E. CLARKE, K.C., the Right Hon. R. B. HALDANE, K.C., M.P., Mr. E. BOYLE, K.C., Mr. F. W. PEMBER, Mr. D. C. BARTLEY, Mr. T. M. SNAGGE, Mr. W. C. RYDE, Mr. J. KEMP, Mr. W. M. LOEHNIS, Mr. A. G. DU CANE, Mr. BOYDELL HOUGHTON, and Mr. T. MATHEW. The Tottenham and Enfield District Councils were represented by Mr. G. J. TALBOT and Mr. F. H. MAUGHAM; and the Kent Urban Authorities by Mr. A. J. RAM, K.C., and Mr. KEEN. The Counsel conducting the case of the Water Board are Mr. FLETCHER MOULTON, K.C., the Hon. J. D. FITZGERALD, K.C., Mr. G. M. FREEMAN, K.C., Mr. HONORATUS LLOYD, and Mr. A. B. SHAW. Mr. ARTHUR PAGET, the Clerk to the Court, was in attendance.

Mr. BALFOUR BROWNE, on behalf of the New River Company, said that, as the result of communications which had passed, the following three gentlemen were proposed to represent the shareholders of the Company: Mr. Seth Taylor (Adventurers' shares), Sir Roger W. H. Palmer (King's shares), and Sir John Glover (preference shares). At present they had nothing to do with the inquiry; but ultimately, when the question of division came before the Court, they would have a good deal to say.

Mr. CYRIL DODD, K.C., who appeared on behalf of three of the holders of entire adventurers' shares forming the dissentient minority—Mr. Worthington, Mr. Ravenscroft, and himself—asked that Mr. Worthington should be appointed to represent them on a question dealing with section 48 of the Metropolis Water Act, by which the Board had to pay compensation for loss of office sustained by Directors of the Company. He explained that the difference of opinion was on a point which would probably be solved by Act of Parliament.

The PRESIDENT appointed Mr. Worthington.

Mr. BALFOUR BROWNE, before opening the case for the East London Company, suggested that certain points at issue between the Water Board and the Water Companies generally should be postponed for the time being—viz., as to whether the sinking fund clause and the sterilization clause were to be taken into account as diminishing the value of the undertakings. These matters depended to a considerable extent on the interpretation of Acts of Parliament; and the best course was to postpone them to a date to be fixed.

The PRESIDENT said the Court would adjourn these matters, and proceed with

THE EAST LONDON CASE.

Mr. BALFOUR BROWNE, after referring to certain sections of the Metropolis Water Act, 1902, said what the Court had to do was to arrive at the sum to be given to the Company for their undertaking. There was no agreement as to water stock; and, at the present time, having regard to the position of the Money Market and other things, they did not see their way to accept water stock—they wanted sovereigns. In the definition clause, the word "undertaking" included all rights of taking water. These rights were defined largely by Act of Parliament. Parliament had given the Company the right to take water from the River Lea, and also, to a smaller extent, from the Thames. The quality of the water of these rivers was not a question before the Court. If they were improper sources of supply, Parliament ought to have taken them away. The point had been raised by the London County Council; but he ventured to say that two Royal Commissions had decided against them. The duty of the Company was to supply good potable water—to make it so; and on this point Counsel for the Water Board were entitled to be heard. He thought he should be able to convince the Court that the water the Company supplied was a perfect one. But the words in the section were that the Company were to transfer all rights of taking, distributing, and supplying water; and this was what they were to be paid for.

The PRESIDENT said he understood that the learned Counsel's contention was that the question of the pollution of the Lea was not open, but that the subject of the distribution of potable water was. Were they not connected?

Mr. BALFOUR BROWNE admitted that this was so.

The PRESIDENT: Suppose it was shown that you could not distribute

potable water except at an enormous expense, would not that tend to diminish the value of the undertaking?

Mr. BALFOUR BROWNE admitted that it would, and said that to some extent the condition of the Lea was a question in point. But he was going to prove that what the Company supplied was a perfect water. Sub-section 5 of section 23, although in many respects a change from the old form, was, he thought, a change without any difference. There had been considerable discussion over certain words—"to the end that their award or awards may effect a final and equitable settlement;" but they did not carry the thing a bit farther. Then sub-section 8 was rather important: "In fixing the sum to be paid by the Water Board, the Court of Arbitration shall determine the value of the undertaking of each Metropolitan Water Company as if, with the necessary modifications, the law of compensation for the purpose of the Lands Clauses Acts were applicable to the case." There was no modification. Then: "Provided that the Court shall not make any allowance for compulsory sale." There were no such words as "compulsory sale" in the Lands Clauses Acts; but a custom existed to allow a certain amount to an owner if he could not ascertain the full value of his undertaking in the future. The sub-section proceeded: "And shall not take into account any enhancement or depreciation of the market value of any stock or shares of the Company." This was silly, as no one would ever do it. Then: "The Court may make such allowance as they think just, for recoupment of any loss of interest pending re-investment, as well as for the cost of re-investment."

The PRESIDENT asked what time it was suggested should be allowed for reinvestment—three months?

Mr. BALFOUR BROWNE thought it would be a long time in the present case, because the result of trying to float the enormous sum required to buy out the Companies would be that the 3 per cent. stock they were going to issue would go down below par, and other gilt-edged securities would go up very largely; and it would be difficult to replace their investment at a moderate rate. It could be met, of course, by giving the Company the enhanced value of the gilt-edged securities. He contended that the Company were entitled to the costs of the arbitration, and thought the case was an absolutely simple one, having nothing unique about it. He would ask the Court to look, not merely to the present income, and not merely at the burden it bore of unproductive capital, but to adjust their income, having regard to the fact that present unproductive plant would in a few years inure to the benefit of the Water Board. The learned Counsel then dealt with what was to be valued, and handed in several plans of works. He explained that the way in which the Company valued their undertaking was as follows: They found the income was a certain amount; but it was necessary to adjust it in some particulars, one of which was with regard to sums paid to other Companies for water, which came to £26,000 in the account year 1902. This state of things had passed away, as the Company had now opened two large reservoirs. Therefore they had eliminated from that year the £26,000, and had charged themselves with the interest upon the new reservoirs, the value of which was £300,000, amounting at 3 per cent. to £9000 a year. This was the kind of adjustment which had been made in their accounts. Then the Company had a large amount of back-dividends outstanding, which they were at liberty to pay; and they were also not up to their maximum rate of interest. On the point as to whether or not the dividend was maintainable, the learned Counsel contended that it was not the duty of a Company to go to Parliament for further powers when their existing works were exhausted, or unable to supply the whole of the people in the district. If they failed to supply, there was no penalty except that outside London any local authority had a right, under section 52 of the Public Health Act, to supply themselves. The Company would only be in default for not supplying if they had capital powers and could give a constant supply by spending money. Such a state of affairs had never occurred. Their failure was due to the fact that they had not statutory powers to supply. The failure which took place in 1895, 1896, and 1897 was not because they would not do the work of storing water, but because they could not do it; and this was due entirely to the action of the London County Council. The learned Counsel was proceeding to go into details, when

The PRESIDENT asked if he need labour the point.

Mr. BALFOUR BROWNE said a great deal was made of it on the other side.

Sir JOHN WOLFE-BARRY: Your point is that, whatever the circumstances may have been years ago, the new reservoirs have altered them.

Mr. BALFOUR BROWNE: That is exactly it.

The PRESIDENT: And you say you have charged yourselves with interest on the money expended upon these new reservoirs?

Mr. BALFOUR BROWNE: Yes. Continuing, the learned Counsel said that Lord Balfour of Burleigh's Commission had declared that the quality and quantity of water was sufficient; and they estimated that 35 gallons per head per day was the outside requirement of the population, even looking ahead to the year 1931. Their conclusions were practically adopted by Lord Llandaff's Commission; and he was at present prepared to accept the finding of these Commissions, until he heard what Counsel for the Water Board had to say. Turning to the tables which had been prepared, he said that up to a certain point the Accountants on both sides were fully agreed. The total revenue, corrected (which did not mean adjusted) for 1902 was £401,032 5s. 10d., and the total expenditure £210,283 19s. 3d.; leaving a balance of £190,748 6s. 7d. Adding certain items, the total came to £191,107 14s. 8d.; and deducting the debenture interest paid—£69,521 4s. 5d.—left a balance on that year of £121,586 10s. 3d. The Accountants for the Company appended a note, agreeing to the figures, but stating that, in order to arrive at the true trade profit of the period, there should be added to the net profits sums in respect of the Chamberlain of London's sinking fund, interest on unproductive capital, water purchased from other Companies, maintenance charged in excess, special remuneration and law charges, income-tax in excess, superannuation in excess, and rent of unlet land. These were the adjustments the Company wished to make. On the other side, the Water Board's Accountants wanted deductions in respect of depreciation, further contributions to the sinking fund, legal expenses, sand used for filtering purposes, and protection of water claimed by the Lea Conservancy. In answer to the President, Counsel explained that the tribunal would be referred principally to one particular year, adjusted, as the basis of the claim; but, in order that they might have the whole history before them, he handed in a table showing the years 1893 to 1902. He entirely denied the claim made by the Board for deductions, contending that it was altogether wrong. The Company's adjustment would add the sum of £43,815 to the £121,586 10s. 3d.; giving the amount to be capitalized £165,402. He submitted that this should be multiplied by 36·36 years' purchase, which brought out the round figure of £6,014,618. Three sums of £27,002, £181,722, and £20,614 were added as the capitalized value of the net increase in income for the years 1905, 1906, and 1907 respectively; a further sum of £402,818 for arrears of dividend; and £601,338, the capitalized value of the annuity which would come into their possession after 1923, bringing up their total claim to £7,248,112.

At the conclusion of Counsel's speech, the Court adjourned.

Third Day—Tuesday, Oct. 27.

At the commencement of the proceedings to-day,

The PRESIDENT asked whether the Company's 10 per cent. limit had ever been reached.

Mr. BALFOUR BROWNE said it had not; but they were close to it now. Last year, it was 8 per cent. The learned Counsel went on to explain, in answer to further questions, that there was both a chemical and a bacteriological examination of the water. He thought no complaint had been made as to it.

The PRESIDENT said the most convenient course would be, the Company's income being admitted, to prove that the works were in such a condition as to maintain it, and then prove the value of the items which the Company desired to be added—leaving the deductions to be dealt with by the other side, and reserving, if necessary, the right to call rebutting evidence thereon.

Mr. *W. B. Bryan*, the Company's Chief Engineer, was the first witness. In answer to Mr. CRIPPS, he said the whole area of supply was 85,692 acres, of which 53,560 acres were actually supplied; 8237 acres were within, and 45,323 acres beyond, the County of London. The total population supplied in 1902 was 1,465,807. The future increase was expected to take place outside London, in Essex. There were four sources of supply—the River Lea, deep wells in the chalk in the valleys of the Lea and Roding, the Thames at Sunbury, and springs at that place. In 1893, there were eight storage reservoirs, with a joint capacity of about 610 million gallons. The raising of the Racecourse reservoir and the construction of the two additional reservoirs authorized by the Company's Act of 1894—making ten in all—brought up the storage capacity to 1200 million gallons. The reservoirs authorized in 1897, lately completed—twelve in all—gave an additional 1200 million gallons, or a total of 2400 million gallons, a combined water area of 479 acres, and a shore line of upwards of 15 miles. The amount of existing storage on the Lea would provide 22,500,000 gallons a day to the Company, and 5,400,000 gallons a day to the river, at the end of a drought equal in intensity to that prevailing between June 1, 1901, and Feb. 28, 1903—the longest continued drought known. The Company had twelve pumping-stations, and five covered reservoirs; the latter having a total capacity of 20,800,000 gallons. At present, when all the wells were being pumped, they could get about 20 million gallons a day; and when those at present being sunk were completed, it would raise the amount to about 24,500,000 gallons daily. The number of supplies to houses, all on the constant system, at the end of 1902, was 221,421. The total length of water-pipes, to which were attached 10,436 valves and 10,253 hydrants, was 1019 miles. The average daily supply during 1902 was 40,177,000 gallons, which worked out at 27·67 gallons per head per day. The Company had about 380 districts, each governed by a Deacon meter. In witness's opinion, an average quantity of 28 gallons per head per day would be ample for the future. Of this quantity, approximately 8 gallons per head represented meter or non-domestic supply, and could probably be reduced. The amount of water required to supply the probable population in 1912 would be 46,732,000 gallons per day; and in 1924, 53,732,000 gallons per day. The Company would have available, when the wells in progress and the reservoirs sanctioned were completed, 54 million gallons daily. This was made up of 22 millions from the Lea and reservoirs, 10 millions from the Thames, 20 millions from wells, and 2 millions from gravel springs at Hanworth. The general result of the provisions of the River Lea Water Act, 1855, was that the Conservancy had a paramount right to water required for the purposes of the navigation, and that the remainder was divided between the New River and the East London Companies practically in equal shares. The witness then gave particulars to show that the present works of the Company were amply sufficient for any call that might be made on their pumping, filtration, and distribution plant. He said the filter-beds had an area of 31 acres, and they were ample to effectually filter at a slow rate all the water required. Complaints had very seldom been made of the quality of the water, which was analyzed by Sir William Crookes and Professor Dewar for the Companies, and by Dr. Thorpe on behalf of the Local Government Board. The Company's net profit was £165,402 for the year 1902. The accounts for the year ending June 24, 1904, should show a considerable increase. With regard to the adjustments claimed by the Company's Accountants, £5750 depended on whether or not the sinking fund was to be taken into consideration; £5417 was interest on unproductive capital; and £26,039 was for water purchased. As to the unproductive capital, the witness produced a table showing what capital had been expended up to Dec. 25, 1902—a total of £534,247 18s. 9d., making with adjustments £11,026 17s. 7d. He explained the items in detail. The items for bought water had been eliminated because the season was abnormal, the flow of the Lea being the very lowest on record; and the Company's reservoirs were now full and in working order, and ready to meet any demand upon them. The question of prospective income was then gone into.

In cross-examination by Mr. MOULTON, witness admitted that he had

taken the Company as possessing the works of next year; but he demurred to Counsel's estimate of the expenditure of that year. He said there was an exceptional expenditure in 1902 on bought water; and, in his opinion, this item ought to be eliminated, and, instead thereof, the interest on new works charged to the Company. The Engineers had been through the accounts, and adjusted them independently of the Accountants. In 1895, the frost year, there were very large repairs effected; and the item for maintenance was much less in the account year (1902). His opinion was that the unusually severe conditions of 1895 could not occur again. The mains had been lowered to a depth at which they would not be affected by frost in future. In "maintenance" he included everything—reservoirs, mains, meters, pumping, and filtration—the total revenue expenditure connected with works.

Mr. MOULTON: I understand maintenance and repairs refer to the reservoirs, mains, and meters. Pumping charges are not maintenance and repairs.

Witness: I cannot tell you, for the moment, what the Accountants have included.

In further cross-examination on the point of the estimated increase of population, witness said he took his figures from the number of inhabited houses; but the estimates based on the census were always too high. The adjusted figures for 1902 were obtained by a census of new houses.

Mr. MOULTON: I want to know whether the 1902 figures are got from the census.

Witness: At the date of the census in 1901, I divided the houses by the number of supplies given by the Company. This gave me a coefficient, which outside London is 5·85. It does not matter whether the houses are a little fewer or a little more. I take the number of supplies divided into the actual population on April 1, 1901. This has been agreed between the Official Water Examiner and myself; and we have also corresponded with the Registrar-General. His estimate of population came to within one-tenth of 1 per cent. of mine. I have no hesitation in saying that my figure for 1902 will be within 1 per cent. of the actual number.

Where do you get the average quantity of water required daily, 28 gallons per head?—The actual figure for last year was 27·67 gallons, taking the population at 1,451,279.

Further cross-examined, witness said, with regard to the water bought from other Companies, they had been supplied by the New River, the Southwark and Vauxhall, the Grand Junction, and the West Middlesex Companies. The two latter supplied *via* the New River. The water from the Southwark and Vauxhall Company came into the East London Company's mains on the north side of the river through the Thames Tunnel near the Tower. The water supplied *via* the New River came through a 36-inch main into the Company's reservoirs at Walthamstow. On the subject of meter charges, he said that both inside and outside London they were fixed by statute, with the exception of a small part where the Company were free to make an agreement. The maximum quantity of water taken from the Thames at Sunbury and the wells at Hanworth was 10¾ million gallons per day. The Company were tied to this amount by their present pumping plant and stand-by. The water supplied by the Company was proved, both chemically and bacteriologically, to be excellent.

Fourth Day—Wednesday, Oct. 28.

To-day the cross-examination of Mr. *Bryan* was continued by Mr. MOULTON. The learned Counsel, proceeding on the lines of the previous day, put a number of questions in great detail to the witness with regard to the supply on which the Company could rely in future.

The PRESIDENT, interposing (as he had done on two or three occasions), said that all this detail produced no effect upon his mind. He did not know what it would do hereafter, when he had heard it all, and he did not wish to stop Counsel if he thought it material.

Mr. MOULTON then dealt with the question of storage. The witness said the whole of the supply obtained from the Lea was taken into storage reservoirs. The capacity of the reservoirs was 600 million gallons in 1894, 1200 millions under the 1897 Act, and the remaining powers were obtained in 1900. He had given evidence before Committees on the necessity for storage, and had stated that the 1897 reservoirs would not be sufficient to carry the Company over the dry years he was dealing with. In 1899, when the powers subsequently obtained in 1900 were first applied for, he had said that when their reservoirs were depleted, if there were a drought equal in intensity to that of the previous year, they would not be able to continue furnishing a constant supply. In 1900, he had said that the storage capacity was insufficient in case of drought. That was with the population at that time. It was not his opinion now. He had been changing gradually, because he had been cutting off the waste. At one time they were supplying 35 gallons per head per day; now the supply was less than 28 gallons, and there was a better pressure all over the district. The difference of 6 or 7 gallons per head per day effected a saving of nearly 10 million gallons, and this had entirely changed the conditions. The pressure was greater, the district had a better supply, and everything was better throughout.

Mr. MOULTON: In 1901, according to your tables, you were giving a supply of less than 30 gallons?

Witness: Yes, 29·26 gallons; but my opinion, as stated before the Committee of 1900, was based upon my experience of the previous year, 31·40 gallons. The difference multiplied into 1,400,000 leaves us far more water than would carry us over.

In 1901 you say you were giving 29 gallons per head, and your reservoirs would have been empty in case of drought. What is there besides the reduction from 29 to 27 gallons to make you alter your opinion?—The saving of 2 gallons per head per day means nearly 3 millions per day. This multiplied into 120 or 150 days' drought would fill the reservoirs; and, in addition, we have considerably more well water now than we had then. We have reduced the amount to 27·69 gallons.

In further cross-examination, the witness denied that the Company's expenditure on increase of supplies had been normal in the last few years. The reservoirs must be taken into consideration. The Company went for twenty or thirty years without them. Now they had constructed reservoirs to carry them on for a considerable period in advance; and therefore the reservoir expenditure would not come into the account. In reply to Counsel's statement that he was referring to expenditure other than that on reservoirs, witness said the business of the Company had been carried on very skilfully. They had already incurred the expenditure on great trunk mains in the outer portion of their district. The wells and reservoirs were there, and the trunk mains north, south, and east were in position. They would have no further great outlay on these trunk mains. The future expenditure would be merely on a network of small pipes in the districts where new estates might be developed; and a sum of £10,000 was put down for this.

Mr. *Daniel Hill*, Fellow of the Institute of Chartered Accountants, and one of the Company's Auditors, was next called. In reply to Mr. BALFOUR BROWNE, he said that adjustments of accounts must be made, some abnormal receipts and expenses having to be eliminated. He considered the following adjustments should be credited, in order to fairly show the profits of the business: City Chamberlain's sinking fund payments, £5750; interest on unproductive capital, £5417; water purchased from other Companies, £26,039; maintenance charged in excess, £2889; special remuneration to Secretary and law charges *re* Water Bill, £2050; income-tax excessive, £1005; superannuation excessive, £1250; rent of unlet land (estimated), £500. These made a total of £44,900, from which were deducted: Abnormal receipt, £221; and Engineer's estimate for additional pumping, &c., from new reservoir, £864—making the total adjustments £43,815, which added to the profit of £121,587 made £165,402. As to the Chamberlain's sinking fund, witness said the Acts stated that the Chamberlain was to invest in the Company's stock or use the funds in such manner as Parliament might determine. This had been done by section 8 of the Metropolis Water Act, 1902, and the stock would be cancelled; so a claim might be made to eliminate the £5750 from the adjusted account. The sums already paid out of revenue had become unproductive expenditure, and would go to the Water Board in reduction of the price they had to pay for the capital value of the assets. This should be returned to the shareholders. With regard to interest on unproductive capital, as the Board took over the debenture stocks, the interest must be deducted from the income before showing the available balance for dividend upon the share capital. But as the assets to be handed over to the Board were of three classes, not all of the interest ought to be deducted—viz., the works, &c., which were producing the income of £160,443, the works in progress or completed for the future development of the business, at present producing no income, and the cash lying at the bank on capital account, available for future capital expenditure, at present producing less than 3 per cent. The debenture stock issued to provide for the last two assets was raised at a discount, and at considerable expense. If the business and assets were bought upon 36, or any other number of years' purchase of the income, the Company would receive nothing, if no income were brought into account, in respect of assets which were believed to be fully worth the cost of upwards of £500,000. At present there was a large sum of money on deposit, earning less than the 3 per cent., which had to be paid upon the capital raised to provide it; and on June 24, 1904, a considerable amount would remain on deposit. The money was for the future benefit and development of the business; and the Company ought not to lose, but rather to gain, by their foresight in having provided this fund—amounting probably to upwards of £100,000. In explanation of the item of £26,039 for water purchased from other Companies, witness said that if this stood in the accounts as an expense, and the Company had also to pay interest on new reservoirs, which cost £300,000, they were paying the same thing twice over. If the water in 1903 was to come from their own reservoirs, it would be entirely wrong to charge them with the £26,000. The Engineers estimated the cost of pumping the Company's own water would have been £724, and other expenses £140.

Sir JOHN WOLFE-BARRY: Mr. Bryan gave us the amount of 1341 million gallons as being obtained, and put under pressure into the mains. If it is delivered to the Company under sufficient pressure to avoid all pumping whatever, you are saved not only pumping into the reservoir, but also into the mains at high pressure to the extent of 1341 million gallons; and this is, to some extent, a set-off against the £26,000.

Mr. BALFOUR BROWNE: I quite admit it. We ought to have all the expenses that we shall be put to as against what we are saving. Mr. Bryan will go into it.

Further examined on the subject of the maintenance and repairs, witness said that on the purchase or sale of a business it was his practice to pay special attention to the charges under these heads, particularly where there was much property, plant, and machinery, because such expenditure bore no relation generally to the amount of business in any year, but varied. The correct charge was based upon the average of seven years. The Water Board sought to put down something for depreciation; but such a charge was not admissible or justifiable. He believed the Company's lands had increased enormously in value; but, of course, no credit was taken in the accounts in respect of such appreciation. Therefore £27,224 appeared to be the proper sum to charge for 1902, instead of £30,113—being an adjustment of £2889, which should be allowed. As to special expenditure, he expected the whole of the £2050 put down would be recovered under section 23 of the Act; but they were not proper charges in the account for the present purpose. The adjustment of the income-tax was at the average of the past seven years—making a difference of £1005. The amount for superannuation was not fair, because in the account year a highly-paid officer had just come on the pension list. As to the sterilization clause of the Act of 1900, witness said he did not think the Act purported to curtail or prevent the shareholders benefiting from the additional use made of the old capital expenditure.

Mr. MOULTON subjected witness to a long cross-examination.

The PRESIDENT asked the witness whether, in the case of an old-established fluctuating business, he would sell on the basis of the last year's profits or on an average of years.

In reply, witness said in the case of an increasing business he would sell on the last year; but in that of a fluctuating business, on an average of years. He stated that the business of the Company was an increasing one, looking at the trading profits.

Sir JOHN WOLFE-BARRY pointed out that the trade profits also fluctuated.

Mr. BALFOUR BROWNE said the decline in 1895 was due to the frost. He thought the profits were increasing.

Fifth Day—Thursday, Oct. 29.

Mr. *John Gane*, Chartered Accountant, in answer to Mr. CRIPPS, gave a summary of the modifications proposed by the Company, and dealt with each in detail. Practically, he substantiated the views expressed by Mr. Hill. On the item of interest on unproductive capital, he gave the following summary: Expenditure upon which the full interest has been paid and charged, after deducting £300,000 for 1897 reservoirs, £100,899—interest at 3 per cent., £3027; capital issued in 1902, £250,000—actual interest paid, £3855; intercommunication capital expended in excess of receipts, £1970—interest at 3 per cent., £59; original cost of lands not used for undertaking, £7000—interest at 3 per cent., £210. Total capital, £359,869; total interest, £7151. From interest deduct interest on money on deposit, &c., £1734; total, £5417.

Sir *William Crookes*, in examination by Mr. BALFOUR BROWNE, said that from 1881 he had personally conducted the daily analyses of the London waters. The results of the analyses were sent to the Local Government Board, and they appeared in the monthly reports of the Water Examiner. He showed by figures going back for many years that the quality of the filtered water had improved steadily year by year, not only in the filter-wells at the works, but as drawn from taps in consumers' houses. In August, he reported in unfiltered River Lea water 189 microbes to the cubic centimetre, and in September 330; filtered, the 189 had been reduced to 33, and the 330 to 29. From this, he would say that the water supplied was pure and wholesome. The initial number of microbes in the raw water had practically nothing to do with the number supplied in the filtered water. He agreed with the words of Lord Balfour's Commission: "We are strongly of opinion that the water as supplied to the consumers in London is of a very high standard of excellence and of purity, and that it is suitable in quality for all household purposes."

In answer to the PRESIDENT, witness said that scientific appliances would keep pace with the requirements necessitated by the increased population on the banks of the Lea. They knew exactly where the microbes came from, and how to deal with them.

In reply to SIR JOHN WOLFE-BARRY, witness stated that the expression "markedly impure," which had been put to him by Mr. Moulton, as applied to the Thames water supplied to the public on a particular day, was an incorrect one to use. He quoted the following from a French authority: "Exceedingly pure water would contain under 10 microbes; very pure water up to 100; pure water up to 1000; average water up to 10,000.

Mr. *Charles James Whittington*, a member of the Stock Exchange, said he was of opinion that, including a reasonable allowance for expenses of reinvestment and possible loss of interest, the fair compensation would be 34 years' purchase of the proved income. In cross-examination, he admitted that water stock was not a Trustees' security. Bank of England stock was quoted at 319 to 324, which was 32½ years' purchase.

Mr. *John K. Hichens*, the Chairman of the Stock Exchange, put the number of years' purchase at 33⅓, to which would have to be added cost of reinvestment, possible loss of income pending investment, &c., amounting to from £1 15s. to £2 per cent. Further, it would not be unfair to make some allowance for the possibility of a change in prices, seeing that six months might elapse between the making of the award and the payment of the compensation.

Hon. *Lawrence Alan Brodrick*, a member of the Stock Exchange, said that the number of years' purchase should be the mean between the number of years' purchase of the annuities of London and North Western Railway debenture stock and Consols on the appointed day, to which should be added the cost of investment, 1 per cent., and the loss of interest—viz., the difference between the rate on deposit on the appointed day and (say) 2¾ per cent.

Mr. *F. A. Bevan*, Chairman of Barclay and Co., Limited, and a Director of the Alliance Insurance Company, put the number of years' purchase at 33⅓, with the addition of 2½ per cent. for reinvestment, &c.

Mr. *Charles Hawksley* was next called, and examined by Mr. BALFOUR BROWNE. The learned Counsel was stopped by the President in an endeavour to elicit from the witness his method of valuing the undertaking of the Company, Sir Edward Fry remarking that this was to be determined by the Court under the Act. Witness said the works were in good condition, and would enable the Company to go through the dryest seasons without having to purchase water, by reason of the storage reservoirs constructed under the Act of 1897. The Company's figure for repairs, maintenance, and renewal of the works (43 per cent.), was the right one required to maintain the divisible profit of £164,779. It would not be proper to put away anything further for depreciation. Mr. Bryan based his estimate on 28 gallons per head per day, which was ample. He believed it could be reduced to 25 gallons.

Mr. *E. M. Eaton* and Mr. *G. R. Strachan* gave evidence confirming that of the previous witness.

After some discussion as to procedure, it was arranged that Mr. Balfour Browne should argue his case with regard to the sinking fund and sterilization clauses, although at the commencement of the day it was decided to take them the following Monday.

Mr. BALFOUR BROWNE began by quoting section 20 of the East London Water Act of 1886:

> From and after the expiration of three years from the issue rom time to time of any debenture stock, there shall be carried to a sinking fund in each year such percentage or such amount of the debenture stock as shall be equal to the excess of the average percentage of the dividend or interest paid for that year on all the capital of the Company, whether share capital or borrowed, above the interest, including the income-tax of such interest, together with an additional 1 per cent. added thereto for management of such debenture stock issued. Such sinking fund shall be held and applied by the Chamberlain of the City of London as trustee for the purpose of purchasing or sinking any share capital of the Company, or for such other purpose as Parliament may from time to time determine.

Apparently the three years was, the learned Counsel said, to enable the debenture stock to fructify. When it had fructified, then the whole of the divisible profit of the Company had to be thrown together; and if it amounted only to 4 per cent., nothing went to the Chamberlain at all. If, on the other hand, it amounted to 6 per cent., then 3 per cent. had to go for the debenture stock raised, 1 per cent. to the Company for the cost of management, and 2 per cent. on the new debenture stock had to go to the Chamberlain. First of all, he pointed out that this 2 per cent. had to come out of profits—it was a portion of the money which had been earned by the undertaking. It was no part of the working expenses of the Company. Ultimately, Parliament said it was to be held by the Chamberlain to go against the purchase money of the undertaking. Counsel contended that it was the undertaking which the Company had to sell; and the undertaking when relieved of the sinking fund. If it had been a permanent charge, it would have been different.

The PRESIDENT: If you had gone on, you would have had to pay it.

Mr. BALFOUR BROWNE: Yes; but it has ceased to apply to the Water Company before transfer. After reading sections 2, 37, and 23 (subsection 8) of the Act of 1902, Counsel said that the burden did not affect the net income of the Company, because it was something taken out of the net income. The tribunal had to value the undertaking, which undertaking produced the sinking fund money just as it produced the dividend. This was the undertaking the Water Board would receive. If the tribunal knocked off the £5700, they would be handing over to the Water Board property worth that money for nothing. Secondly, he contended that it was no part of the obligation upon him to continue it, because it might have been swept away. It was no part of the obligation upon the undertaking, because only those which were to be transferred to the Board were to be considered under the definition clause. With regard to the sterilization clause, the 1900 Act said: "If the undertaking of the Company is purchased within seven years from the passing of this Act, otherwise than by agreement, by any public body or trustees, nothing in this Act shall authorize the Company to bring into account, or make any claim in respect of, any advantages conferred on them by, or resulting from, the passing of this Act, provided that in the event of such purchase the Company may bring into account the actual amount of any capital expenditure made by them in exercise of the powers of this Act." The Company were not bringing into account any of the capital under the Act. He did not know of any advantage that they had derived under the Act; and they were not claiming for any advantage.

The PRESIDENT; If that is so, no question arises at all.

Mr. BALFOUR BROWNE said it could not have been intended to touch the capital, because that was dealt with in section 45. He contended that his view of the sinking-fund clause was right, and that, with regard to the sterilization clause, there was nothing to go upon.

Sixth Day—Friday, Oct. 30.

On the resumption of the proceedings to-day,

Lord *Rothschild* was the first witness called. In answer to Mr. BALFOUR BROWNE, he said he assumed that the Companies would satisfy the Court as to their stable maintainable income, and the Water Board ought to pay such compensation as would assure this income to the shareholders. In his opinion, it was not practicable for the Board to make an issue of their stock and pay the compensation in cash. That would be a very wasteful method of dealing with the matter, and have a very disturbing influence on the markets. The shareholders should receive such a sum as would enable them to purchase, at the time they received their money, an equally secure investment returning the income which they were giving up. At present, such security could be obtained at 33 years' purchase; but, looking ahead a year or so, a larger sum ought to be paid to ensure the shareholders being able to purchase. To this must be added the expenses of the reinvestment, and the possible loss of interest by not being able to get an investment at once.

In cross-examination by Mr. MOULTON, witness said he could not remember, as a banker, having had water stock brought to him as security on loans; but if it were, it would be treated on the current prices of the day. This, however, was in the case of a temporary loan. The capital price of the stable maintainable income represented the public appreciation of its value, less the disturbing circumstances from day to day. In the case of an investigation like the present, the price of water stock was appreciated or depreciated according to the estimate made by the public of what took place.

Mr. *Edmund Faber*, M.P., the Chairman of the English Bankers Association, and a Director of the London and North-Western Railway, examined by Mr. BALFOUR BROWNE, said the fairest way to value the undertaking would be to give £100 for every £2 12s. 6d. of well-secured income. This would be about 37 years' purchase. In 18 months' time, judging by the past, the market would be considerably higher than it was to-day.

Mr. BALFOUR BROWNE then referred the Court to several cases mentioned by him on the previous day in support of his contention with regard to the sinking fund and sterilization clauses, so far as they applied to the East London Company. He summarized his argument by stating that the sterilization clause had gone by reason of the Act of Parliament—having nothing to act upon. The sinking fund had done all that it was intended to do. In the last few years, the Company had been contributing to the sinking fund, and could not ask for it back. It was put into the hands of the Water Board as part payment of the undertaking. It was only until purchase that it was to be accumulated, and then it was to go against the purchase-money. There was no necessity for the continuation of the obligation, and this was why the word "undertaking" was defined as being subject to the obligations transferred.

Mr. MOULTON, in replying on the sinking fund and sterilization

clauses, said the sinking fund contribution was, by statute, as much part of the price at which fresh capital could be raised as the 3 per cent. interest payable on the debenture stock. The Company were allowed to raise this stock for the purpose of their undertaking, paying the 3 per cent. interest to the persons who provided the money, and also a certain calculated interest, which never formed part of the profits of the undertaking. He submitted that Mr. Balfour Browne's argument hopelessly failed in its basis. The money was never the Company's, with the exception of 1 per cent. for management during their life. It was not part of the profits, but of the costs. As to the sterilization clause, the effect was that when the Company went to Parliament for further powers, Parliament said they should have them for the purpose of their works, for the public benefit, and if these were not purchased within the next seven years, they should have them as ordinary powers, but if purchased within this period by a public authority, the powers should not be taken into consideration in valuing their property.

The PRESIDENT: I want to get from you what are the specific advantages to the Companies under the Act.

Mr. MOULTON said that generally it gave them water resources which made them equal to their statutory obligations for many years. He would call evidence to show that the opinion of Mr. Bryan in 1890-1 was substantially accurate—that the 1897 reservoirs and wells practically brought them abreast of their present needs, but no more.

The PRESIDENT: Do you say the storage reservoirs have been used?

Mr. MOULTON: No.

The PRESIDENT: Have the Company entered into agreements with any other Metropolitan Water Company for taking excess water?

Mr. MOULTON: No.

The PRESIDENT: Have they borrowed under the borrowing powers of this Act?

Mr. MOULTON: Yes; £500,000.

The PRESIDENT: That will be covered by the proviso of section 47?

Mr. MOULTON: Yes; so far as the capital expenditure is concerned.

The PRESIDENT: Then what advantage do you say is conferred upon them?

Mr. MOULTON: At this moment they have spent a large portion of the money in making wells, which they are counting upon for supply. It goes to the maintainability of the income.

The PRESIDENT: What proposition do you put with regard to the sterlization clause?

Mr. MOULTON: I say the Company cannot support any claim for the value of their undertaking which depends on the possession of powers affected by the sterlization clause. It appears to me that Parliament drew a distinction between granting powers in order that the public might not suffer, and granting powers which would bring advantages to the Company.

At the conclusion of this argument,

Mr. MOULTON opened the case on behalf of the Board. He said that he would do so apart from the sterilization clause, though, of course, he did not abandon his point. The real prime entry on which Mr. Bryan had started was the number of supplies, which he multiplied by a factor to get the population. Mr. Bryan had increased by a constant quantity the population for a period of 21 years, which was contrary to all experience of population. He would call evidence to show that the population was rapidly growing in this particular district. No doubt a portion of it was full—perhaps the greater portion of West Ham; but East Ham and the parts north of it were very suitable for building. He thought Mr. Bryan had started with a higher population; and though this sounded like an act of generosity, it was not so, because he used it as the divisor, in order to get his supply per head. Mr. Bryan started too high, but the increase would be greater than he thought.

The PRESIDENT: It is in his favour if the population increases more rapidly, is it not?

Mr. MOULTON: Yes; but we say it brings him face to face with his difficulties earlier. Our view is that this is a Company whose obligations have brought it to the end of its resources. Continuing, the learned Counsel said, with regard to debenture stock, that the amount estimated for 1903 was £2,251,166, or about £200,000 more than would appear in 1902. The nominal amount for 1900 was £576,000, of which £490,000 was paid up. The Company claimed that they would not have to issue any more until the year 1911. Then they said they would issue only £10,000 per annum until 1918, and after that £110,000 till 1923. They further said they had at their bank enough money for capital expenditure on the mains and wells, &c., for another nine years. After five years, they would only spend at the rate of £10,000 per annum; and the serious expenditure would commence by the building of the reservoirs. Assuming that the Company had these powers, he contended that they must exercise them, if at all, during the next seven years. As to the Company's net incomings, he differed widely from the Accountants. They could not draw any distinction between what was called remunerative and unremunerative capital. In Mr. Gane's table, he had struck out the cost of the bought water, but had not debited himself with the cost of the reservoir.

The Court then adjourned till yesterday (Monday).

Deep Artesian Borings in Queensland.—We learn from the "Engineer" that up to the end of June last there were 960 artesian boreholes in Queensland, aggregating a total depth of 1,171,461 feet. During the twelve months, the number of bores was increased by 26, and the depth bored by rather less than seven miles. The average depth of the bores, which range between 10 feet and 5045 feet, is 1220 feet; and the number of flowing bores of which the estimated or measured flow is recorded is 576. The aggregate daily flow is estimated at 385,504,854 gallons—an increase on the preceding year of about 10 millions. On this basis, the annual flow is said to represent the equivalent of a rainfall of 12 inches over an area of about 808 square miles. The highest temperature of any of the water tapped is 202° Fahr. The depth of this particular bore is 4523 feet, and the flow is 1,600,000 gallons per diem. This is also the largest volume of water ever tapped from so deep a bore in Queensland.

DANISH GAS COMPANY.

The Annual Meeting of this Company was held last Thursday, at the London Offices, No. 13, Victoria Street, S.W.—Mr. CORBET WOODALL in the chair.

The LONDON AGENT (Mr. H. G. Warren) having read the notice convening the meeting,

The CHAIRMAN moved the adoption of the report and accounts. In doing so, he said he thought he could say, from the financial aspect at any rate, that the report for the year was a very satisfactory one. They had an increase of net revenue of rather more than £7000 over the amount earned last year; and this enabled the Directors to recommend the declaration of the usual dividend, to put £8000 to the depreciation fund, £1000 to the reserve fund, and to carry forward £3000 more than this time last year. Of course, the shareholders would bear in mind that, speaking of the amounts carried to reserve and depreciation funds, they did not bring into account the dividend on £70,000 of the Company's shares which they held as a Company, and the interest on which was apportioned each year between the reserve and the depreciation fund. In the current year, they carried to reserve £3950 of this amount, and to depreciation £2000—the £5900 operated automatically from year to year. The improvement in the past year was due to the somewhat lower price paid for coal, to the better return from the residuals sold, and to the increasing business. There had been, as the report stated, an increase of 5 per cent. broadly over the whole area of their supply. Interest had cost them £700 less than last year. This was due to the conversion of the 5 per cent. bonds into 4 per cent. debenture stock, which was, he thought, a very satisfactory change in the interests of the Company. The capital expenditure had increased during the year about £26,000, and now stood at slightly above £700,000. The constant increase of the capital was, of course, essential with a Company growing as this was. He assured the shareholders, however, that the expenditure was watched with the greatest care by the Directors; and that no capital whatever had been spent that was not represented by an asset in the shape of works. So long as this was the case, he thought they might, with light hearts, continue to subscribe to any new issue that might be made. He had taken out a few figures to illustrate this. In 1901, the capital was increased by £38,000. The capital then stood at £913 per million cubic feet of gas sold per annum; and the dividend cost 12·15d. In 1902, they spent rather more than £24,700. This was net. But the capital per million cubic feet had fallen to £906; and the dividend to 12d. In the year under consideration, they had spent a further net sum of £26,000; but the capital had again fallen to £893 per million cubic feet sold, and the dividend to slightly over 11d. Turning to the works, the Directors were not able to report the commencement of the building of the new works at Flensburg. The shareholders were aware that the present works there were somewhat crowded, and the Municipality had refused permission to extend on the present site, and that, although they had only some ten years left of their concession there, they were obliged to build new works. After much negotiation, the Board had come to terms with the Municipality; and they thought the terms were satisfactory. The Municipality undertook to purchase the works from the Company at the end of the concession, to bear some portion of the cost of constructing the new works, to provide the ground and level it, and to provide the foundations, piling, and so on, as well as an excellent quay, with a guaranteed depth of 6 metres, or (say) 20 feet, of water. It was absolutely essential that the Company should commence the erection of these works forthwith; but, unfortunately, the number of authorities who had to consider, and whose approval had to be obtained to, the plans for the works were so many that time was wasted, as the Directors thought, very sadly. In addition to this, a Brewery Company near by had objected to the building of gas-works close to their premises; and the Company would have to answer their objections in a Court of Law. They had a letter that morning saying that the case would come on in the course of a very few days, so that he hoped—certainly within a month—all difficulties would be out of the way, and that they would be able to proceed. At Aalborg, they were in much the same position as at Flensburg. They had only a comparatively short time for the concession to run there. The works were full up; and in view of the fact that, when they were taken over by the Commune, the Arbitrator, who would have to determine the value, had to take into account the suitability of the works for further extensions of the business, the Board felt it would be folly to continue on the limited site. They had therefore removed to a suitable site on the Harbour, and had there erected new and much more extensive works. On the 5th inst., he attended in Aalborg, and, with the very capable assistance of the Bourgomaster, opened the new works. He was glad to say the opening was attended by practically the whole of the Council of Aalborg, and by the important people of the town, who expressed themselves very much pleased with the property which might some day be theirs; and he thought the relations which had been a little strained between the Company and the Municipality of Aalborg would in future be more pleasant. In anticipation of this removal, the Company bought, some three or four years ago, a new site; and it was a large and valuable one. They found the Municipality were rootedly opposed to the Company building upon it; but the fact of their holding it, and having the right to build on it, helped them to come to a settlement with the town. They paid over £18,000 for the land; and it was now theirs to make the best of. He was glad to say the Directors were able to make some arrangements when out there, which would aid the development of the site, and they would, he had no doubt, come out of the purchase, at any rate, without loss. His colleagues, Mr. Gardiner and Lieut.-Col. Davidson, had also been in Denmark during this month, and had visited most of the works—partly with him (the Chairman) and partly alone. He was glad to say they were all satisfied with the general condition of the works. They had a good staff, and he thought, without exception, capable and earnest men on the works; and he believed that the manufacturing results would, at any rate, be maintained. Referring for a moment again to the question of the depreciation account. The necessity for this he need not point out, because, as the shareholders knew, their concessions were all limited as to time; and the object of

the depreciation fund was to provide that they should, at the end of the last of the concessions, be able to hand over to the shareholders what was practically the present market value of the shares they held. In the current year, the Directors added £10,692 to the depreciation fund; and they had deducted from it £10,000 on account of the loss they had incurred through the removal of the works from the old site to the new one at Aalborg. They had also credited against the capital account £10,700, which was the sum the Aalborg Corporation had agreed to pay the Company when the contract was at an end, in consideration for the abandoned values on the old works. The sum was settled by valuation; and the Directors considered it a fair one. Perhaps a concrete example of the way the depreciation fund served its purpose might be useful. When they parted with the Veile works, they had been in operation forty years. The capital account stood at £22,700. The Company received from the Commune £17,000, so the actual loss was £5700. Fortunately, they had put aside a special depreciation account for Veile (as the period was short), amounting to £3300; and they had to withdraw from the depreciation fund a sum of only £2300. This was merely a small concern, and, of course, on the larger undertakings, when they came to an end, they would probably lose larger sums. But the arrangements the Board were making with regard to the depreciation fund would, they were satisfied, prove sufficient. The total amount added to the reserve and depreciation funds altogether amounted to £15,800 for the year. The Chairman then referred to a number of matters of a personal character that had happened during the year—among them mentioning the retirement of Mr. Marshall, who had been the Company's Chief Engineer 22 years. He wished to return to England and carry on his work here. While the Directors regretted to lose his services, as they felt they had no answer to give to his wish, they had accepted his resignation, and appointed him their officer in London. During the time he had been with them, he had done very good and valuable service for the Company. He had rebuilt several of the works in a manner which had won the admiration of all who had seen them; and he (the Chairman) hoped, when he returned here, he would be able to carry on his own business satisfactorily to himself. The Directors, at any rate, would always be glad to feel they had him at their elbows in case of need. In his place, they had appointed Mr. A. W. Edwards, the Resident Engineer at Frederiksberg, as Chief Engineer. He had been in their service practically from the time he was born. His father was Mr. Marshall's predecessor; and Mr. Edwards himself had been in various departments of the service for many years past—chiefly at Frederiksberg. He had made a good name for himself; and the Board had great confidence that he would prove a very efficient Engineer and Manager in Denmark.

Lieut.-Col. T. H. LEWIN seconded the motion, which was carried unanimously.

Lieut.-Col. LEWIN next proposed that a dividend be declared of 3 per cent. on the preference shares for the half year to June 30 last, and a further dividend of 4½ per cent. on the ordinary shares, making, with the interim dividend of 4 per cent., 8½ per cent. for the year.

Mr. R. S. GARDINER seconded the proposition, which was agreed to.

Resolutions were subsequently passed re-electing Mr. W. J. Kingsbury and Mr. Corbet Woodall as Directors of the Company.

Mr. G. P. BIDDER (who has been one of the Auditors, but was not seeking re-election) moved the re-appointment of Mr. Edwin Waterhouse as an Auditor and the election of Major Critchley to fill the vacancy. He made the interesting statement that, during the eight years he had been Auditor, the capital had increased by about 27 per cent., and the profits about 40 per cent.

Mr. JOSEPH REESON seconded the motion, which was unanimously carried.

The usual complimentary votes to the Chairman and Directors, and to the officers and staffs at home and in Denmark, were cordially passed.

SINGAPORE GAS COMPANY, LIMITED.

The Transfer to the Municipality—The Last Meeting.

Pursuant to section 142 of the Companies' Act, 1862, a General Meeting of this Company was held on Thursday, at the Cannon Street Hotel, E.C., to enable the Liquidators (Mr. Samuel Spencer, formerly the Chairman, and Mr. Robert M. Christie, formerly the Secretary) to lay before the shareholders an account showing the manner in which the winding-up of the concern has been conducted, and the property of the Company disposed of. A report and statement of accounts had been circulated by the Liquidators; but all the features of public interest will be found set out in the address of Mr. SPENCER, who presided, and who was supported by his former colleagues on the Board.

Mr. CHRISTIE read the notice calling the meeting; and the Liquidators' report and accounts were taken as read.

The CHAIRMAN said at this, the final meeting in connection with the Singapore Gas Company, his first words must be of regret that the liquidation had taken so long, but he could assure the shareholders that no time had been lost. They would perhaps remember that in September, 1901, it was decided to liquidate; and they fully hoped that in eight or nine months they would be able to close the estate. No sooner, however, had the Liquidators commenced their duties, than various difficulties presented themselves; and as everything had to be transacted with Singapore, the delay in correspondence caused much time to be occupied. At last the matter of expenses as to Mr. Ford's (the late Manager's) passage home, &c., became an awkward feature between the Municipality and the Liquidators; and as, in accordance with Clause 4 of the "Agreement for Sale," it was distinctly set forth that the Municipality were to take over these expenses, they were, in the interests of the shareholders, compelled to enforce the claim. After much correspondence between the Company's Solicitor and the Municipality's, it was agreed that the Liquidators should accept the offer of the Municipality, which amounted to about two-thirds of what was claimed. They thought at the time, and did so now, that every penny asked for should have been met; but at such a distance, to fight it out in Court, would have prolonged the winding-up of the Company many months. It was therefore concluded that, in the interest of all concerned, the best thing to do was to bring about an early settlement; and so they closed with the offer made. As soon as the amount of the purchase money was received, they immediately paid off the debenture holders. Following this, payments were at once commenced, on account, to the shareholders; and in all £2 17s. 6d. per share was returned to them, which, under the circumstances, the Liquidators considered highly satisfactory, as at one time it certainly did not look as though the shareholders would get half this sum. The Liquidators hoped, as they were sure the Directors did, that the shareholders would consider that they had done as well as was possible in their interests. It is usual on such occasions as this to mention some of the transactions of the Company that was being liquidated. The first remark naturally was that this one was established in 1856, with the usual surroundings, and with every hope of their realization, and that the Company would, in a short time, pay 10 or 12 per cent. dividends. The dollar was then at 4s. 6d.; and shortly after, on one or two occasions, the money came over at a premium, as the dollar was worth 4s. 8d. But the returns, from this condition of things, gradually dwindled down to as low as 1s. 9d. for the dollar. During the 46 years of the Company's existence, the average dividend paid had only amounted to 4¼ per cent., which, as had been said before, was a miserable return for capital invested abroad—more especially in view of the fact that, in closing up the affairs of the Company, they had only some 60 per cent. of their capital returned. It might be interesting to mention that, when the Company started, the first shipment of materials was lost, through pirates, which were numerous in the fifties. They boarded the vessel carrying the apparatus, and scuttled it; and the ship and contents were sunk. Another interesting point worth mentioning was that, in all their correspondence during the 45 years, they had never had a letter or document miscarry—excepting those in the vessel that was sunk. In closing the transactions of the Company, he thought the best thanks of the shareholders and Liquidators should be given to Mr. Ford, through whom, being on the spot, every point that arose between the Company and the Municipality was settled. They felt sure he gave the Municipality as much satisfaction as he did the Liquidators. The accounts now presented had been examined and certified by the Auditors. In conclusion, he might mention that, after paying certain necessary expenses, since closing the accounts, there would be left a small balance, and the Liquidators would be glad if the shareholders present would pass a vote as to its distribution. The Chairman then proposed that the report and accounts as presented by the Liquidators be agreed to.

Mr. W. T. BATTEN seconded the motion.

Several explanations were sought by Mr. H. W. SMITH as to various items in the accounts: but they possess no general interest.

The motion was unanimously agreed to.

Then followed the passing of a number of other resolutions. The first voted to Mr. Christie the small balance remaining in hand; and the second condemned the whole of the books and papers of the Company to destruction. Mr. SMITH moved a vote of thanks to the Liquidators, and this was seconded by Mr. B. GREEN, and heartily passed. In the response by the CHAIRMAN, it transpired that he was, at the time of the formation of the Company, with the Horsley Company, who supplied the plant that was on the ship scuttled by pirates; and further that, if it had not been for the intervention of the Right Hon. Joseph Chamberlain, who was approached in the matter, the shareholders would perhaps have received less than they had done by about 30s. per share. The Auditors (Messrs. Magnus Ohren and Mr. Thomas Guyatt) were also heartily thanked for their services. The latter mentioned, in his reply, that the accounts had been very satisfactory indeed. His colleagues and himself had gone through them most carefully, and certified them without any reservation whatever. The books had indeed been admirably kept by Mr. Christie. Succeeding this was a cordial vote of thanks to the late Manager (Mr. Ford), of whom many kind and richly-deserved things were said.

With this shower of votes came to an end the last meeting of a Company which has, as its history shows, had a life of peculiar vicissitude for a gas undertaking.

Gas-Stoves and the Chimney Sweeper's Calling.—Last Wednesday, Dr. Wynn Westcott held an inquest at Shoreditch, touching the death of John Watts, a chimney sweeper, of no fixed abode, who died in Shoreditch Infirmary. Maria Watts, the widow, deposed that she had been living in Macclesfield Place, but on Monday last entered the City Road Workhouse. Her husband had not lived with her for six years, and at times he would sleep at a Salvation Army shelter or in the street. The Coroner inquired whether he could not earn a living at chimney sweeping. Witness said he used to earn a good one; but the work went down, like many more trades, owing to the use of gas-stoves, and latterly he could hardly earn enough to keep himself. She added that he took to drink, and sold up his home. Dr. E. S. Norton, Medical Superintendent, said that death was due to bronco-pneumonia, accelerated by alcoholism; and a verdict to this effect was returned.

Louth Gas Company.—The annual general meeting of this Company was held on the 24th ult.—Alderman Longbottom (the Chairman) presiding. The Directors submitted the financial statement for the twelve months ending the 30th of September, which showed a balance of £2193 to the credit of the profit and loss account. The Directors recommended dividends (less income-tax) of 13¾ per cent. on the original capital, 10¾ per cent. on the new ordinary stock, 1877, and 5 per cent. on the two classes of improvement stock. The payment of these would absorb £1904, and leave a balance of £279, out of which the Directors suggested that £225 should be applied in repayment of the amount owing to the insurance fund account, and the balance carried forward. The Chairman, in moving the adoption of the report and accounts, referred to the successful demonstration the Company had made in lighting the streets of the town on the incandescent system. The motion was carried unanimously.

FATAL ACCIDENT TO A GAS MANAGER.

The Dangers of Ladders to Scrubbers.

On Monday morning last week, a shocking accident occurred at the Dalton-in-Furness Gas-Works, the result of which was that Mr. William Jones, the Manager, received fatal injuries. About ten o'clock, three men were passing the works when they heard someone moaning and crying out, "Oh, save me;" and on closer investigation, they noticed Mr. Jones hanging head downwards from a stay rail of a ladder fixed against a scrubber. They immediately released him and carried him into his house. Two doctors were sent for; but Mr. Jones died before their arrival. An inquiry was held into the matter on Wednesday, when evidence was given to the effect that the deceased, who was 65 years of age, had gone up the ladder, which was 35 feet high, with the intention of turning off the water from the scrubber. Though a very active man for his age, he was not in the habit of climbing ladders; and on this occasion he was wearing a pair of light slender shoes. It was supposed that in descending he slipped, and was saved from falling to the ground by his leg catching in one of the stays. He, however, struck his head, from the injuries to which he died. The District Factory Inspector who was present (Mr. J. Law) expressed the opinion that such ladders as the one in question were not so safe as they should be; and that spiral staircases, now generally in use, were much better. The Coroner (Mr. Poole) remarked that though this was not a matter for the Jury, the Inspector wished it to be mentioned. The Jury returned a verdict of "Accidental death."

INCANDESCENT GAS LIGHTING IN STEPNEY.

At the Meeting of the Stepney Borough Council last Wednesday, the Works Committee reported upon an offer made by the Commercial Gas Company to convert to the incandescent system all the existing ordinary public lamps in the district. The present cost to the Council is £3 9s. per lamp per annum; the Company keeping the lanterns glazed, fixing new burners when necessary, and painting the lamps and columns once a year. The Company now offered to fit, at their own expense, all the lamps in the principal thoroughfares in the Borough which at present are not on the incandescent system with No. 4 Kern burners, at a charge for the first 18 months of £3 9s. per lamp per annum. The only proviso was that the Council would continue to use the lamps, when altered, for a period of 18 months, when the Company would be prepared to reduce the charge to £2 18s. It is claimed that the No. 4 Kern burner gives a light equal to 100-candle power; and this the Company proposed to maintain by renewing the mantles when necessary. Without any increase in the cost, the Committee stated, the lighting of the borough would be considerably improved by accepting the Company's offer. It was therefore recommended that all the streets, except those at present lighted by electricity, and those which would probably be lighted by this means within about 18 months, should be lit with incandescent gas. In the course of discussion, it was mentioned that the offer had been practically accepted at a previous meeting, and the Borough Engineer had been instructed to compile a list of streets. The following resolution was adopted: "That the offer of the Commercial Gas Company be accepted on condition that the conversion to the incandescent system be carried out within three months from the date of signing the contract; also that the lamps be maintained in all respects to the entire satisfaction of the Borough Engineer."

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Gas Engineer's Salary.

At the Meeting of the Edinburgh and Leith Gas Commissioners on Monday of last week (Mr. D. Purves, the Convener of the Works Committee, in the chair), after the minutes of the previous meeting had been approved, Mr. Douglas gave notice of motion to the effect that the Commissioners consider, or re-consider, and report on the question of the salary of the Gas Engineer (Mr. W. R. Herring). The notice was signed by himself and Bailie Waterston. Bailie Gibson asked if it were reasonable that such a motion should be submitted to the Commissioners. He took it that the Commissioners had agreed to give certain terms to Mr. Herring, and that Mr. Herring had sent a letter accepting the conditions. The matter was closed; and he wished to know if the motion was in order. The Chairman replied that there could be no question that it was most irregular. Mr. Douglas contended that the increase was agreed to under mistaken ideas. Bailie Gibson refused to allow that to be said. If anyone had a mistaken idea in regard to the matter, he had not. He was convinced that they had done the right thing. The Clerk then read the following letter from Mr. Herring, dated Oct. 9:—

> My Lord and Gentlemen,—Allow me to express to you my sincere thanks for the increase you have made to my salary, and which I am pleased to accept, in accordance with the terms of the minutes, as a satisfactory settlement and award for the services I have rendered, and may still render, in connection not only with the general management of the undertaking, but also on account of the extraordinary operations in connection with the construction of the Granton works. I may say that it will be my earnest endeavour to serve the Commissioners to the very best of my ability, and to still further the interests of the gas consuming public.

The Chairman remarked that this letter would be recorded and duly stamped. Mr. Wight said they had now a commercial agreement, and could not back out of it, either as honourable or business men. This was all done for platform purposes; and it was contemptible. Mr. Douglas thought, as business men, they should not allow the matter to pass. It was rushed. Only three months ago they discussed the question of the salaries of the whole of their officials; and the Commissioners then thought that Mr. Herring did not require an advance. The Chairman said he could not allow the discussion to go on longer. Mr. Douglas pointed out that the other Commissioners had discussed the matter at Ward meetings, from their point of view. Bailie Mallinson said Mr. Douglas had discussed the matter before, and had been beaten; and he should not show so childish a spirit. The Chairman asked the members to support his ruling that the discussion should cease; and the proceedings closed.

THE ROCHDALE CORPORATION FINANCE COMMITTEE AND THE GAS RESERVE.

Several particulars in which improvements might be made were suggested by Messrs. Ashworth, Mosley, and Co., who were called in to audit the accounts of the Rochdale Corporation last year. One of these, which has already been acted upon, was that the cost of gas for street lighting should be paid out of the general rates. Other points to which the Auditors drew attention were the practice of the Corporation in charging a quarter in advance for water-rentals, and the fact that in their accounts, which are made up to March 25 each year, they do not reckon as accrued liability the amount due as interest on loans, dividends, and stock from January to March. It appears that, soon after the Corporation took over the water undertaking, the Committee, being apparently short of money, gave credit in their annual accounts for water-rentals for five quarters in a single year, thus anticipating a quarter's receipts; and this has been done ever since. The amount which in this way is shown in the water accounts for the past year is £7413; while the three months' interest, &c., on loans, which the Auditors urge should have been included in the Corporation accounts, comes to £11,329. The Finance Committee have decided to adopt the suggestions of the Auditors; and this involves the raising of no less a sum than £18,742. The gas-works reserve fund of £21,275 was thought to be a likely source from which to obtain the necessary money; and accordingly a deputation of the Finance Committee last Wednesday waited upon the Gas Committee to ask their assent to the adoption of this course. They were, however, met with a polite refusal—only three members supporting the proposal. Under these circumstances, the Finance Committee have decided to create a suspense account, and to levy a penny rate annually until the amount is cleared off. The Gas Committee will pay their share of the accrued interest (£1747), so that the amount to be raised is left at about £17,000.

Referring to the subject subsequently at an election meeting, Mr. Sharp (who in the Gas Committee moved the amendment declining to entertain the suggestion made by the deputation from the Finance Committee) said it was easy to see why the Gas Committee were anxious to guard their reserve fund. In years to come, the works might want practically renewing; and there might be a new Committee who, if the money was now allowed to go, would blame the present Committee and the Manager for not making provision for future needs. Mr. T. B. Ball, at the meeting of the Committee referred to, entered his protest against the reserve fund being touched for other purposes. He told the members that he, as Manager, was responsible for the good government and the conduct of the works; and that, if the money was taken from the reserve fund, and something involving an expenditure of several thousands of pounds should happen, his position would be very awkward—especially if, without protest, he now consented to the reserve fund being touched.

COOKING-STOVE RENTS AT LEICESTER.

The question of charging for the hire of gas-cookers was raised at last Tuesday's meeting of the Leicester Town Council, when Mr. Bruce moved—"That the Gas Committee be instructed to discontinue (as from the expiration of the current quarter) to make all the charges now demanded from consumers for rent of cooking stoves." He said the department made huge profits; and these profits did not depend upon the rents charged, but mainly upon the price of coal and the returns for residuals. The abolition of the rent would be beneficial to the ratepayers and to the department alike. The Manchester City Council had recently abolished rent for gas-cookers; and during the past year the number of gas consumers had increased by 1500, and the gas sold by about 1½ per cent. Mr. Edwards (the Chairman of the Gas Committee) said he was surprised that Mr. Bruce brought this matter to the Council before the Committee. It was Committee work, and the Council ought not to be called upon to do the Committee's business. Mr. Bruce was a member of the Gas Committee; and if he had carefully looked into the business, he would have understood it better, and would have told them a different tale. He said the stove-rents amounted to £2800 per year. They had in the town 38,926 cooking-stoves, 14,068 of which were charged rent directly, while 24,882 were connected with slot meters. They did not charge rent for those directly; but they charged the rent in the price of gas. If they abolished the stove-rents, they must also reduce the price of gas to those who employed slot meters. It was thought by some of their friends that the department was making a fine profit upon these stoves. The actual rent worked out at 3s. 3d. per stove per year; but it cost £5556 for renewal and maintenance. This meant that the renewal and maintenance came to 3s. per stove per annum, which left them with the splendid amount of 3d. a year as rent for each of their stoves and for the investment of their money. They had spent upon stoves £72,000; and he would ask if the amount of 3d. per stove was anything like enough to pay interest and sinking fund upon this sum. In addition they spent £8285 a year in depreciation. The stoves altogether brought in £6337, so that on this account there was a loss of something like £2000. It was said that if they abolished rents, they would have a larger demand. They had about 51,000 gas consumers, including those in the villages; but

there were only about 40,000 houses in the town. Nearly every house in the town nsed cooking-stoves at present, as could be seen by the fact of their having supplied 38,921. This being so, they could not supply many more. If they gave the stoves free, they would have a number of people coming at once to the gas office who would want their stoves removed and different ones put in. The customers chose their stoves now according to the rent. If they were supplied free, they would have dearer stoves; and no doubt if the rents were abolished, a large number of the inhabitants would instantly require larger stoves, which would mean that they would have to spend a very large sum on large stoves, and have the small ones on hand. They had abolished meter-rents, which meant that they had handed over £52,000 to the town. He should like to ask why the people who used cooking-stoves should do so at the expense of the general ratepayers. They did charge less money for gas-engines than for other purposes. People who had gas-engines were large users of gas; and unpurified gas would do for them as well as purified. Unless they had made this concession, they would have had 379 large consumers making their own gas; and as they had a profit from this source, the action of the Committee was very well advised. The Mayor (Alderman Vincent) said it was a serious thing that these constant doles should be advocated, which put up the rates of the town. If they gave away these rents, it would increase the rates by 2d. in the pound; and this increase would constantly go on. In the present state of the rates, he asked the Council to seriously consider the wisdom of any course which would put them up. The profits on the gas undertaking were exceedingly moderate. Some twenty years ago, when the undertaking was half its present size, the proceeds were as much on an average as now. The bulk of the advantage had been given to the consumers. He asked the Council to hesitate before they adopted a policy which would increase the rates for all time. The motion was defeated by a large majority.

A Big Reservoir Contract at Bradford.—A recommendation of the Water Committee, that the tender for the construction of what is to be called the Angram storage reservoir in connection with the water-works in the Nidd Valley should be let to Mr. John Best, was agreed to at last week's meeting of the Bradford City Council. The amount involved is £365,492. Tenders totalling close upon £20,000 were also accepted for the construction of service reservoirs at Calverley Moor, Pudsey, and Hartshead. Alderman Holdsworth, the Chairman of the Committee, stated that the Corporation had already spent about £750,000, and were not getting benefit for more than one-third of what the Nidd Valley undertaking would produce, as there was nowhere to store the water which was coming down so freely. They had a difficulty, too, with regard to the filtering. They could filter up to a certain point, but could not remove all the colour from the water. When they had the reservoir at Angram, they would be in a much better position. It would, however, take seven years to construct.

MUNICIPAL GAS SUPPLY IN GENEVA.

Those of our readers who have visited the beautiful city lying at the south end of Lake Leman will probably remember that the lighting service is in the hands of the Municipality. Both gas and electricity are the illuminants employed; the works for the manufacture of the former being under the supervision of M. Des Gouttes, while those for the production of the latter are in the hands of MM. Graizier and Saugey. We have received from the first-named gentleman a copy of the accounts of the gas undertaking for the past financial year, from which we extract the following particulars.

Commencing with the works, it may be mentioned that they are situated to the west of the city, on the left bank of the Rhône, at a point not many hundred yards from the confluence of that river with the Arve—a spot to which most visitors to Geneva turn their steps, to witness the phenomenon of the muddy waters of the latter flowing side by side with the beautifully blue stream which had been purified in its passage through the "clear, placid" lake immortalized by Byron. The works are not particularly extensive, having a frontage of about 700 feet; but as an example of the combination of the old with the new in gas plant, they are probably unique. While the original gas-holders, with their heavy masonry tanks and their guide-pillars, put up some time in the forties, are still in use, the works are sufficiently up-to-date to possess inclined retorts, Humphreys and Glasgow's water-gas apparatus, and De Brouwer's coke-conveying plant. There are four or five different systems of retort-settings; the latest additions being a bench of six arches of nine horizontals on M. de Lachomette's system, and a mechanical coke-conveyor similar to the one in operation in front of the inclined retorts. Five of the above-named arches were completed last year, in the early months of which an installation of coke-sorting plant was brought into use, and has since been rendering good service. The De Brouwer conveyor also has given great satisfaction to the Engineer. Another useful and highly beneficial addition to the works was carried out last year in the shape of the erection of workmen's bath and mess rooms. This building, which is about 130 feet long and 20 feet wide, occupies a central position in the works, in close proximity to the retort-houses. It is in two storeys, the lower one containing shower and foot baths, and a large washhand basin, 33 feet long (all supplied with hot and cold water), two ordinary bath-rooms, a room for drying clothes, and three closets. On the first floor is the mess-room, 66 feet by 20 feet, containing hanging-cupboards for the stokers' use, a kitchen fitted with several gas-stoves, a scullery, a small sick-room, and a hall for the use of the superior officers in the works. In fitting up this building, hygienic rules were most carefully followed; all the appliances being strong and easily cleansed. The tramway lines were extended, so as to allow the coal-trucks to be run alongside of the retorts. Outside the works, the mains were extended by 9635 yards

MILBOURNE'S

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ERECTED OR IN HAND AT THE FOLLOWING GAS-WORKS:

WREXHAM, DORKING, MITCHAM, RUGBY, EVESHAM, BOLOGNA (ITALY), SEDGELEY, VALPARAISO (CHILI), BANGOR (IRELAND), DRAYCOTT, BRITISH GAS COMPANY (ETRURIA STATION), STRATFORD-ON-AVON, &c., &c.

SOLE MAKERS—

C. & W. WALKER, LTD.,

Midland Iron Works:
DONNINGTON, NEWPORT, SALOP.

London Office:
110, CANNON STREET, E.C.

bringing up the total length (after allowing for replacements of pipes) to 180,450 yards.

Coming to the work done by the plant last year, the quantity of coal carbonized was 26,685·87 metric tons, compared with 25,522·61 tons in 1901—a difference of 1163·26 tons. The average price per ton, on the works, was 35 frs., against 36·65 frs. in the preceding year. The coal is obtained principally from certain French mines—from Montrambert, Firminy, and Blanzy in the south, and Béthune and Courrières in the north; but some was procured from the Saar mines in Germany. The average yield of gas per 100 kilos. was 28·548 cubic metres, or about 10,100 cubic feet per metric ton, which was a slight increase on the yield in 1901. There were altogether 39,507 retorts under fire during last year; the average production of gas per retort per day being 6813 cubic feet. In addition to the above-named quantity of coal, 357,892 kilos. of oil and 466,390 kilos. of coke were employed in the production of 897,730 cubic metres, or about 31,690,000 cubic feet, of carburetted water gas; being at the rate, in round figures, of 0·4 kilo. of oil and 0·5 kilo. of coke per cubic metre (35·3 cubic feet). The oil cost 14 frs. per 100 kilos. delivered free of customs and port dues at the Geneva Railway Station. The total bulk of gas manufactured was 8,516,070 cubic metres (7,618,340 cubic metres being produced from coal), or rather more than 300¾ million cubic feet. The make was something like 4 per cent. more than in the year 1901. The consumption amounted to 8,518,770 cubic metres, or 300,712,580 cubic feet; and it was apportioned as follows:—

	Cubic Metres.		Cubic Feet.
Consumed by meter	6,969,885	..	246,036,940
Do. on works and offices . . .	77,098	..	2,721,560
Do. for stair and yard lighting. .	434,858	..	15,350,487
Do. for public lighting	561,368	..	19,816,290
Unaccounted for	475,561	..	16,787,303
Total	8,518,770	..	300,712,580

The population of the city and the communes supplied with gas being, according to the last census, 90,000, the total consumption per inhabitant was 94·65 cubic metres, or about 3340 cubic feet. The unaccounted-for gas was about 5·58 per cent. of the total consumption in the year, against 5·44 per cent. in 1901. There were 19,247 consumers by meter (or one for every 4·7 inhabitants), and 19,593 of these instruments were in use, representing a measurement of 362·12 cubic metres, or 12,783 cubic feet, per consumer. In the preceding year, the meter consumption was 6,708,340 cubic metres by 18,768 consumers—being at the rate of 335·9 cubic metres, or 11,858 cubic feet, per head. It may not be out of place to mention that the quantity of gas consumed has shown a progressive increase since the year 1890, when it was 5,425,990 cubic metres, or about 192 million cubic feet. Of the consumers by meter, by far the larger proportion—19,153—burnt less than 3000 cubic metres (106,000 cubic feet) of gas; and there were 1335 consumers by means of fixed jets. At the end of last year, the total number of consumers was 20,582, or 493 more than those on the books at the corresponding period of 1901; and the number of meters on hire was 17,905. During the year, 1195 appliances for cooking and heating by gas were sold; bringing up the total to 20,065. This is close upon one to each consumer. The number of kitcheners fixed at the cost of the consumer and the Gas Department equally at the close of the year was 302, against 264 at the end of 1901. The average annual consumption of gas by these appliances was 676 cubic metres, or close upon 23,900 cubic feet, representing a gross revenue of 149·27 frs. The number of heating-stoves placed on these terms at the same date was 171, against 143; and their average annual consumption was 578 cubic metres, or about 20,400 cubic feet, representing a gross revenue of 123·86 frs. The cost of the gas appliances installed on the system referred to during the years 1897 and 1898 was liquidated at the close of 1902; and, in accordance with the agreements entered into with the consumers, they then became the property of the latter. This reduced the number of kitcheners to 161 and of heating-stoves to 116. The number of gas-engines in use on Dec. 31 last was 13. For the public lighting of the city and the neighbouring communes, 141 additional lamps were put up during the year, bringing up the total to 1985, of which 563 are in use all night, while the remainder are extinguished half-an-hour after midnight. With the exception of 22, all the burners are on the Welsbach system, and for them 10,775 mantles and 3597 glasses were used last year; being an average of 5·5 mantles and 1·8 glasses per burner.

Turning to the residuals, the quantity of coke actually produced was 20,763·53 metric tons; and there had to be purchased, in order to meet demands, 104·10 tons—making together 20,867·63 tons. This was disposed of as follows: Sold to dealers, 12,445,760 kilos.; supplied to municipal buildings, 1,167,590 kilos.; employed for heating retorts, 6,133,990 kilos.; do. boiler, 617,610 kilos.; used in the manufacture of water gas, 466,390 kilos.; used for lighting up the furnaces, 10,450 kilos.; employed for various purposes, 25,840 kilos. Of the entire production, 13,613,350 kilos. was sold and 7,254,280 kilos. used. The quantity of coke employed for heating the furnaces was in the proportion of 22·98 per cent. of the coal carbonized, and 3·5 per cent. of it was small. In addition to the coke, 43,290 kilos. of graphite and 718,290 kilos. of clinker were sold. The production of tar was 1,224,811 kilos., or 4·7 per cent. on the bulk of coal carbonized; and 30,050 kilos. were purchased—making together 1,254,861 kilos. All this was sold, as well as 17,120 kilos. produced in the manufacture of water gas and 40,000 kilos. of pitch. Of concentrated ammoniacal liquor 263,700 kilos. were produced; the average content of ammonia being 18·88 per cent. The yield in ammonia was 0·186 kilo. per 100 kilos., or rather more than 4 lbs. per metric ton, of coal carbonized. Sulphate manufacture is not carried on in the works.

It remains now to look at the financial results of last year's working. The sale of gas to private consumers produced a revenue of 1,612,933 frs. (£64,517), or 66,696 frs. (£2668) more than in 1901; the price being 22c. per cubic metre, or within a fraction of 5s. per 1000 cubic feet, for all purposes. The gas sold for public lighting produced 102,334 frs. (£4093), an increase of 10,931 frs. (£437). This arose, on

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the one hand, from additional lamps put up during the year, and, on the other, from the charge per cubic metre of gas being raised to 17·45c., the net cost, from 15c., at which it was fixed for the year 1901. The sale of coke produced 348,017 frs. (£13,921), out of which, however, 3709 frs. had to be paid for coke bought; making the net amount 344,308 frs. (£13,772), or 42,832 frs. (£1713) less than in 1901. This was owing to the fall in the selling price from 39 frs. to 23 frs. 50 c. per metric ton. The net amount received for tar was 41,518 frs. (£1661); for ammoniacal liquor, 42,906 frs. (£1716). Summing up the financial result of the year's working, the expenditure amounted to 1,652,267 frs. (£66,089); being 59,767 frs. (£2391) more than the sum voted. The gross receipts, however, were estimated at 2,223,000 frs. (£88,920); whereas they amounted to 2,342,969 frs. (£93,719), or 119,969 frs. (£4799) more. The net receipts in excess of the budget estimates were 60,202 frs. (£2408). Last year the revenue was 56,858 frs. (£2274) more, and the expenditure 27,653 frs. (£1106) less, than in 1901; so that there was a net increase to the amount of 84,511 frs. (£3380). The working costs for the year came to 201,689 frs. (£8068), or 38,878 frs. (£1555) less than in 1901, when the amount was 240,567 frs. (£9623). Worked out on the basis of the make of gas, the figure last year was 2·37c. per cubic metre, against 2·94 c. in 1901. The net receipts return 10·72 per cent. on the capital expended up to the close of the year, to meet interest and sinking fund charges and furnish profits. The various communes supplied with gas participate in the total profits realized, in proportion to the consumption.

CREMATING BY GAS.

Mr. M. K. North held a Local Government Board inquiry at Leeds last Thursday, with regard to the proposal of the Corporation to erect a crematorium at the Lawnswood Cemetery. The cost is estimated at £2500. The furnace is to be on a French principle, and the heating will be by gas instead of by coke. The inventor is M. Eugene A. Fradet, of Paris, whose system is in use at Rouen, Rheims, and other Continental places. This method is claimed to be more economical and cleanly than a coke furnace, and has been adopted after an extensive investigation of the subject by members of the Burial Board. It was stated that at Rouen a cremation had been witnessed which was carried out at a cost of only 3s. or 4s. for gas. Arrangements have been made by which the mains will be extended to the cemetery, and gas supplied on special terms for a number of years.

The minutes of the Parks and Cemeteries Committee which were adopted at last Tuesday's meeting of the Bradford City Council, included a recommendation that application should be made to the Local Government Board for sanction to borrow a sum of £5000 (including £650 for a gas-furnace), for the erection of a crematorium at their Scholemoor Cemetery.

ELECTRIC LIGHT QUESTION AT DORCHESTER.

Ratepayers Decline to Embark on a Risky Enterprise.

The Dorchester Corporation, impelled doubtless by a desire to be among the so-called "Progressive" municipalities, two years ago obtained an Order to enable them to supply the town with electric light; and they have lately been considering the best way of setting about the work. At their last meeting, they decided, by a small majority, to keep the working of the undertaking in their own hands; but, seeing that the Chairman of the Electric Lighting Committee (Alderman Duke), who had been an active supporter of the electric lighting scheme, had been led to the conclusion that its retention in the hands of the Town Council would involve a loss to the ratepayers, and that this opinion was becoming prevalent in the town, a requisition was addressed to the Mayor (Mr. S. D. Allen), on the initiative of the Ratepayers' Association, to convene a public meeting to consider the matter. This was held under his presidency on Monday last week, and lasted nearly three hours.

The principal speaker was, of course, Alderman Duke, who proposed a resolution in the following terms: "That in the opinion of this meeting it will be the best course for the Corporation to lease their electric lighting plant to be worked by a company." In the course of a long speech in support of his proposition, he stated that the installation would necessitate the investment of about £16,000, according to the estimate of their expert Engineers; and though the Council had decided to have their engineers, and "run the whole show" themselves, he had seen nothing in the energy displayed by any member of the Council which justified them in assuming that sufficient attention would be given to so intricate and technical a business as electric lighting to ensure its being carried on, at least on starting, on anything like successful lines. His view was that, instead of taking this course, they should have their own plans, their own plant, and conform to the advice of their expert Engineers, but make arrangements with a company to lay the plant down for them, and thereafter to lease it from them for any term up to 25 years, at a rental to be agreed on, and on conditions which he thought they might safely leave in the hands of their Town Clerk. The Council had been approached by certain Companies who offered to supply them with the plant and lease it from them on conditions up to 25 years, for which period they could borrow the loan; and these Companies had offered to pay a rental equal in amount to the interest and sinking fund the Council would have to pay annually to extinguish the loan during the period of 25 years. They further offered to enter into an agreement whereby the lease could be determined at any time on short notice, on the Council agreeing to pay them a moderate sum, to guarantee them some profit for their working over the period during which they might have the undertaking in their own hands. They were also prepared to give guarantees for the supply of electricity at prices which warranted him

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	KINGSTON, ONT.	300,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	CRYSTAL PALACE DISTRICT	2,000,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	25,000	DULUTH, MINN.	300,000	MALTON	150,000
MONTREAL	500,000	CATERHAM	150,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	LEICESTER	2,000,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	ENSCHEDE (HOLLAND)	150,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BURNLEY	1,500,000	NEWPORT MON. (Second Contract)	250,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Third Contract)	750,000
				TORONTO (Fourth Contract)	1,000,000

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as Chairman of the Committee dealing with the matter, in saying that the Council would certainly not be able to run the concern and charge so low a figure. The acceptance of such an offer would make electric lighting a safe business for the town, and ensure the inhabitants from any risk of having to come upon the rates to make up the difference between the returns and the cost. It also ensured the consumers having the light at a reasonable price—viz., 5d. per unit. This was the figure at which the Council had offered to supply current; but he feared they would not be able to do it without creating a heavy charge on the rates, at least for some few years to start with. The Companies further offered to supply them with a light for public purposes at 3d. per unit, and for power at 2d. per unit—lower prices than the Corporation could afford to sell current at if they kept the undertaking in their own hands, and considerably lower than their Engineer told them they could at present produce it for. He proceeded to adduce arguments in favour of the proposal submitted.

The motion was seconded by Mr. Wood Homer, who said that he had from the first been of opinion, based upon statistics, that electric lighting for Dorchester would be a losing concern and would entail enormous cost to the ratepayers. He had taken eight towns of about the same size, and, according to the returns in the "Electrical Times," the profit amounted to £793 and the loss to £4411. The results were that an aggregate of 74,400 persons had the privilege of being lighted by electricity at a capital outlay of about £3 per head at an average price charged of 6d. a unit, and an average loss to the rates of about 1s. a head of the population in the area of supply. Applying these figures to Dorchester, it was proposed to supply an area containing at the most 4000 inhabitants, at a cost of £16,000, or £4 per head. If they took the average loss at 1s. per head with a capital of £3, they must take it at 2s. per head with a capital of £4—adding 1s. as interest on the extra £1 capital. A loss of 2s. per head on 4000 inhabitants would be £400 per annum. He maintained that this extra charge was uncalled-for, unnecessary, and an injustice.

Among the speakers was Mr. H. J. Blakeway, the Chairman of the Electricity Committee of the Southampton Corporation; and he made an interesting contribution to the discussion. He said municipalization was a grand thing, if it benefited everybody; if it did not, they had no right to begin it. One of the greatest mistakes made by modorn municipalizers was that they were too keen on spending the money of the whole of the ratepayers for the benefit of a few of them; and he advised them not to do this at Dorchester. He said he had taken 29 towns, and found the highest average of 8-candle lamps per head of the population was at Blackpool—viz., two 8-candle lamps—and the lowest in Dublin, where it was 0·1 per head. The total of the 29 towns was 19; yielding an average 0·7, or a little over half an 8-candle lamp per head of the population. If they adopted at Dorchester the liberal proportion of one 8-candle lamp per head, which they could only expect after the lapse of a considerable number of years, this would give them, in an area of supply of 3000 persons, only 3000 lamps. The electric light was not only the finest, but also the dearest light; and those who wanted it should be prepared to pay for it. The only mistake the Engineers of the Dorchester Corporation had made in their estimates was that they did not allow for a charge of 7d. per unit. To show a revenue at all they had had to cut the price down to below what they sold the light for in Southampton, with an area of supply containing 107,000 persons. They could not there afford to sell it at 5d. a unit. At present they charged 5½d., and made precious little out of it. During eight years of hard work, they had by luck managed to make the magnificent sum of £932, without setting aside a penny for depreciation. He assured the meeting that, after four or five years, considerable sums would have to be drawn from the reserve fund or from the rates.

The meeting was again addressed by Alderman Duke in reply; and then the motion was put and carried by a very large majority. Commenting upon the result, a local paper says: "The people of Dorchester, late in the day though it may have been, have risen in arms against the suggestion that those who do not use, and who receive no benefit from, the electric light should be made to pay in rates for those who do; and if we are able to form any opinion of local sentiment from the temper and atmosphere of the meeting, we shall have in the approaching polls a pronouncement that will leave no possible doubt. Against so inequitable a proposal there is, in fact, something like a revolt."

LONDON COUNTY COUNCIL AND THE WATER BOARD.

The Council's Comptroller to Assist the Board.

At the Meeting of the London County Council last Tuesday, the General Purposes Committee presented a report on the subject of the application made by the Metropolitan Water Board a few months ago for the assistance of the Council in connection with the preparation of the Board's case to be submitted to the Court of Arbitration under the Metropolis Water Act, 1902, and with the general conduct of the proceedings on their behalf. The special directions in which they thought the Council could help them were by permitting full inspection of the various documents in their archives bearing upon the Metropolitan Water Question, and allowing the Comptroller (Mr. H. E. Haward) to place his services at their disposal. The request was granted by the Council at their meeting on the 28th of July. On the 19th ult., the Clerk to the Board (Mr. A. B. Pilling) wrote to the Clerk to the Council expressing the Board's appreciation of the courtesy shown in this matter, and of their indebtedness to Mr. Haward for the help he had rendered; and, in view of the then approaching resumption of the sittings of the Arbitrators, he asked the Council to authorize their Comptroller to give evidence, leaving the particular points on which it might be desirable that he should speak to be sanctioned, if necessary, by such Committee as the Council should think fit. Mr. Pilling

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added that, in any event, the Board would be glad if Mr. Haward might be permitted to attend the hearing of the case for the first few days; and it was suggested that if this course could be adopted, the exact nature of the evidence which the Board might wish to obtain from him could be more satisfactorily placed before the Council or their Committee than would otherwise be possible. The Committee closed their report with the following recommendations: "(1) That the request of the Metropolitan Water Board contained in their letter of the 19th of October, so far as it relates to the watching by Mr. Haward of the arbitration proceedings, be acceded to. (2) That the General Purposes Committee be authorized to take such further steps as they may deem expedient with regard to affording assistance to the Metropolitan Water Board in connection with the arbitrations under the Metropolis Water Act, 1902." On the motion for the approval of the report, Mr. Strauss said he did not see why the Council should be asked to help the Water Board out of a ridiculous position. It was not their duty to even soil their fingers in touching this matter, except to help the ratepayers. Mr. P. Harris thought it was hardly worth while to take notice of Mr. Strauss's remarks, which were prompted by temper because the Council were not made the Water Authority. Mr. White said many thousands of pounds of ratepayers' money had been spent, and a good deal of it wasted, in obtaining information which the Comptroller had in his possession. Mr. J. Burns, M.P., said the Water Board was created to rob the ratepayer in the interests of the Water Companies. But, to prevent the ratepayers being robbed too extensively, as they might be without the Progressive members of the London County Council on the Board, he hoped the services of Mr. Haward might be granted generously. Mr. M'Kinnon Wood remarked that the Board were inadequately equipped to enter upon the fight with the Water Companies; and, in the interests of London, he thought the Council must allow Mr. Haward, who knew all the details of the matter, to assist. The recommendations were agreed to.

SHEFFIELD CORPORATION WATER SUPPLY.

Free Water for the Health Committee.

At the Meeting of the Sheffield Corporation last Wednesday, the Water Committee presented, as part of their minutes, a report on the desirability or otherwise, in the interests of the public health, of providing, out of the accumulated surplus of the water undertaking, for (1) the abolition of all charges for the supply of water to the Health Department for public baths, urinals, and the cleansing of the streets, courts, and alleys of the city; and (2) the abolition or reduction of charges for the supply of water to private baths and water-closets. This matter was referred to them on the 9th of September. They pointed out that, though it had been stated than an average surplus of "some £6000 or £7000" a year might be anticipated, this sum was an estimate based on calculations as to the probable results of the undertaking for some years to come. The realized surplus on the 25th of March last (£101,918) was not more than the Committee considered, having regard to the magnitude of the undertaking, should be held in hand to meet unforeseen contingencies. As to the £6000 or £7000 surplus, the Council had already voted grants from it amounting to £5980 a year. They recalled with pleasure the fact that the results of the department had hitherto almost always been better than had been anticipated; and they had no reason to believe that the future would be materially different. They were of opinion, however, that, having fulfilled the pledge of the Corporation by the remission of the whole of the 25 per cent. water-rate charges 4¼ years earlier than the Act of Parliament required (involving a loss of revenue now amounting to £27,000 a year), and made other substantial concessions to the consumers to the extent of £6000 a year, and in view also of other considerations, it was not advisable at present to make any further alterations affecting the revenue, but rather to wait for a few years for the result of what had already been done, and the issue of some of the important matters still pending.

The adoption of the Committee's minutes having been moved by the Chairman (Alderman Gainsford), Alderman Clegg proposed an amendment to the effect that so much of them as related to the recommendation not to make any further alteration affecting the revenue of the Water Department be not confirmed so far as they related to the non-abolition of all the charges for the supply of water to the Health Department, but that these should be abolished as from the 25th of March next. He said he found that the net profit on the last year's working was £26,000. But deducting the interest on the sinking fund, £10,200, there was left a net surplus of £15,800; and he found, further, that the accumulated surplus in the hands of the Committee amounted to £102,000. Therefore, what he suggested to the Council was that, as these figures showed the Water Department to be in a very satisfactory condition as regarded finances, it was not an unreasonable thing to propose that a small portion of the surplus profit should be applied for the public convenience. The Health Committee had paid the Water Committee altogether £2216 for water; and he ventured to submit that out of the surplus profit they could easily afford to forego this amount of revenue, as it was for the public convenience, and the benefit of the citizens at large. Mr. Castle seconded the motion. Alderman Gainsford adduced figures to show the inadvisability of making the concession suggested by the amendment, in view of a probable deficiency in the surpluses in the future. He told the Council that every year for ten years, except three, they would come out on the wrong side of the account. After considerable discussion, the amendment was carried by 27 votes to 23.

Southport Gas Extensions.—Improvements have been commenced at the Southport Gas-Works which will entail an outlay of £7000. The additions consist principally of new boilers and the remodelling of the water-gas plant.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

If anyone could induce the Edinburgh and Leith Gas Commissioners to cease their pother over the recent increase in the salary of Mr. W. R. Herring, their Engineer and Manager, they would be doing harm to no one—and, as a matter of fact, they would do something which would conserve the dignity of the Commissioners. The thing has been done, and there is no good purpose to be served by dwelling upon the steps of the process, as was done at last Monday's meeting of the Commissioners. Mr. R. A. Douglas has given notice that he is to bring the subject up at another meeting; but he is too late, as the transaction is ratified and placed on the records of the Commission by this time. An evening newspaper, which would fain get into the fray, is publishing day by day accounts of the capital outlays of gas undertakings in other large towns, with the salaries paid to the managers, which, to tell the truth, do not seem to prove much. But, to show how very difficult it is to be certain of the ground which the writer of any such matter treads upon, I may mention that yesterday afternoon a rival newspaper brought out a correction, which, strangely enough, was not of the figures relating to some distant undertaking, but of the capital of the Edinburgh and Leith undertaking itself. The capital had been stated at £573,649, whereas it should have been £1,897,000, which, it is pointed out, is a difference of £1,323,351; and it is added that the effect of comparisons with other towns is obvious.

Leaving these bickerings for the more profitable work of the Commission, it has to be noted, with pleasure, that the manufacture of gas at Granton continues to be of the most satisfactory nature. The Edinburgh works are again working, so that it is possible to make a comparison with them. At Granton, the average price of coal during September was 13s. 0·5d. per ton, and in Edinburgh 14s. 8·6d. The yield of gas was 10,310 cubic feet per ton of coal at Granton, and 10,288 cubic feet in Edinburgh. The cost of coal per 1000 cubic feet of gas made was 15·18d. at Granton, and 17·14d. in Edinburgh. Manufacturing wages amounted to 1·80d. per 1000 cubic feet of gas made at Granton, and 16·40d. in Edinburgh. The cost of lime and wages for purification was 0·58d. per 1000 cubic feet at Granton, and 0·90d. in Edinburgh. The illuminating power of the gas at both places was 24·69 candles. If these figures, taken from the Engineer's report, do not bear conclusive testimony to the value of the Granton works, it is difficult to know what would. Since May 16, 260 additional gas-cookers have been fixed, which shows that the reduced price of gas is already beginning to tell in the direction of increasing business. The report of the Works Committee contained a statement as to preliminary steps which are being taken for the extension of the Granton works—the foreshadowing of a further great scheme, I suppose. The Commissioners have borrowing powers remaining to the amount of £495,502.

After about seven years dilly-dallying with the subject, the Falkirk Town Council, on Wednesday of this week, agreed, by eight votes to six, to proceed with the erection of new gas-works—and, after all, it is the Thornhill site which they have selected. A Committee has been appointed to negotiate for the purchase of the land. The Corporation require to go to Parliament for power to borrow money for the new works; so that there need be no fear of anything being rushed, even yet. In the course of the discussion on Wednesday, it was mentioned that Messrs. R. & A. Main, Limited, had stated that if they had known there was to be difficulty about the gas supply, they would not have brought their works to Falkirk. This statement was responsible for at least one member of the Council coming round to the Thornhill site; and it may have affected more of them.

To enter upon utterances of candidates at meetings in the course of municipal elections would be an exceedingly onerous task, and is only to be attempted where there are special circumstances to warrant it. I shall, therefore, go no further into the subject than to refer to the remark of Mr. G. Kemp, the Convener of the Gas Committee of the Aberdeen Town Council, who, in an address after an unopposed return to the Council, stated that their late Gas Manager—Mr. A. Smith—in the course of his management, planned and superintended the erection of plant and buildings which cost over £60,000, upon which he was not paid commission, and he believed did not even get thanks. Mr. Smith's salary since 1892 has been £550 a year, and the make of gas last year was 641 million cubic feet. Yet the retiring allowance granted him was only £150. There was, truly, not much generosity here.

The action in the Court of Session relating to the gas supply of Airdrie, to which I referred some weeks ago, is to go on. There was some talk of its being settled; but apparently the decision of the Court is to be taken upon the subject. It looks like a case of grab on the part of the Coatbridge Company; but it has to be remembered, on the other hand, that if they possess statutory rights, it is their duty to protect them, and that they chose, as the moment to assert their rights, the time when another body—the Airdrie Town Council—were about to acquire statutory powers of supply over a portion of the area they claim as their own. They tolerated the Airdrie Gaslight Company, with whom they could have dealt at any time; but if they had allowed the transfer to take place, they would have lost for ever a district which may yet prove a most profitable one for them to occupy.

As showing how eager is the desire in certain quarters to discredit gas management, I may mention that yesterday afternoon, in the midst of an unusually busy season, an Edinburgh evening newspaper found space to state that they had received several letters from gas consumers complaining that their meters had not been read, and that while in adjoining streets consumers were being supplied at the reduced price for gas, they were still being charged at the old rate. The reason is apparent to any schoolboy; but the management of the newspaper thought it necessary to send a reporter to the offices of the Gas Commissioners to inquire into the matter. The explanation is given at considerable length, though not very accurately; and, of course, it is to the effect that some time is necessary for the survey of the meters. The explanation, even as it is given, was quite satisfactory; but the Editor thought fit to add a note, in which he professed to find a discrepancy in it,

FIRE SEASON, 1903-4.

NEW PATTERN

RADIATOR

For Shops, Halls, &c.

The "DURHAM."

No. 1115 - £2 7s. 6d.

R. & A. MAIN, LTD.,

London, Falkirk, and Glasgow.

which, I must really say, it would require microscopical examination to discover. It would seem that, with some people, of whom fairer things might be expected, the rule in treating of gas affairs is the one contained in the well-known expression "Heads, I win; tails you lose."

An explanation, which has every appearance of having been inspired by the Lighting Authority, was published in Edinburgh yesterday as to the reason why the Cleaning and Lighting Committee of the Edinburgh Town Council have given an order for about 250 lanterns to a German firm. It is to the effect that, the Committee having resolved to extend the system of incandescent gas lighting, lamp makers at home and abroad were invited, through the Gas Commissioners, to send in specimen lanterns; and between thirty and forty specimens were forwarded. It is said that, naturally, no specifications could be laid down, as it was the object of the inquiry to procure the best type. The Committee selected three of the specimens, after careful examination, as being the most suitable in design and in price; and these have been experimented with. Two of them were furnished by Messrs. Parkinson and W. & B. Cowan, Limited, and the third one was by Arno von Santen, of Cologne. The two former were square lanterns, and the third was a globular one. It turns out that the British-made lanterns were only a penny dearer than the German one; but the Committee selected the foreign article on account of its strength and lighting properties, as well as of its being easier to clean without damaging the mantles. I may be a little behind the times—or it may be that the Committee of the Edinburgh Corporation are not quite abreast of the times—but I have a notion that the globular form of lantern is being discarded for the square, on account of the greater cost of renewal and the loss of light which it involves. The Committee seem to think otherwise; and their decision, which appears to be final, will be tested by experience. It is difficult to understand why it could not have been possible to specify, if not the dimensions and other features of the lantern, at least its shape. The incident is not a large one; but it illustrates how home manufacturers are made to suffer loss by reason of a little inattention on the part of local authorities.

In the Sheriff Small Debt Court at Stonehaven, on Wednesday, an action was heard at the instance of John M'Lean, of Bervie, against the Bervie Gaslight Company, in which £12 was sued for as damages for loss sustained by the Company having negligently omitted to keep a gas-pipe belonging to them in King Street in a proper state of repair, or to lay it in such a way as to secure it from damage by the passage of ordinary traffic. On the 23rd of April last, the pursuer's wife and three children suffered from poisoning by gas, but happily recovered. It was found that the gas-main had been fractured—it was thought by the passage of a steam road-roller—at some distance from the pursuer's house, and that the gas had gained access thereto by a disused drain. The Company, in defence, maintained that there was no negligence on their part, but that there was contributory negligence on the part of the pursuer's wife, who perceived a smell of gas the day before. Sheriff Henderson Begg gave decree against the Company for £5 and costs.

The Turriff Gaslight Company held their annual meeting on Monday. It was reported that the manufacture of gas was 3,130,000 cubic feet, which was the highest on record, and that, while the income was £879, the expenditure had been £1096—a deficit of £217. This result was brought about by the lifting and relaying of mains at a greater depth, and the laying of new mains. The usual dividend of 5 per cent. was paid, which left a balance against the Company of only £9.

The Committee of the Perth Town Council which was appointed to inquire into the working of the Gas Treasurer's office and the method of book-keeping, have had a meeting with the Treasurer (Mr. C. L. Lindsay), and have agreed to report that the books are kept in accordance with the wish of the Auditor; that the office is not over-staffed; and that the office accommodation should be enlarged as speedily as possible.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 31.

Sulphate of Ammonia.

The week opened with a firm tone; but, immediately it became known that the shale miners' dispute was to be referred to arbitration, buyers withdrew, and it has since been difficult to effect sales even at a decline in prices. Rightly or wrongly, it is assumed that the dispute is practically settled, and that the output of sulphate of ammonia at the oil-works will not be curtailed. The closing quotations are £12 2s. 6d. per ton f.o.b. Hull, and £12 5s. f.o.b. Liverpool and Leith. With the altered position of the spot market, interest in the forward position (which has recently attracted most attention) entirely disappeared, although prices refused a week ago would no doubt now readily be accepted. The value of January-June delivery is nominally £12 10s. per ton f.o.b. at the ports.

Nitrate of Soda.

This is unchanged, the spot prices being 9s. 9d. per cwt. for ordinary quality, and 10s. 3d. for refined.

LONDON, *Oct.* 30.

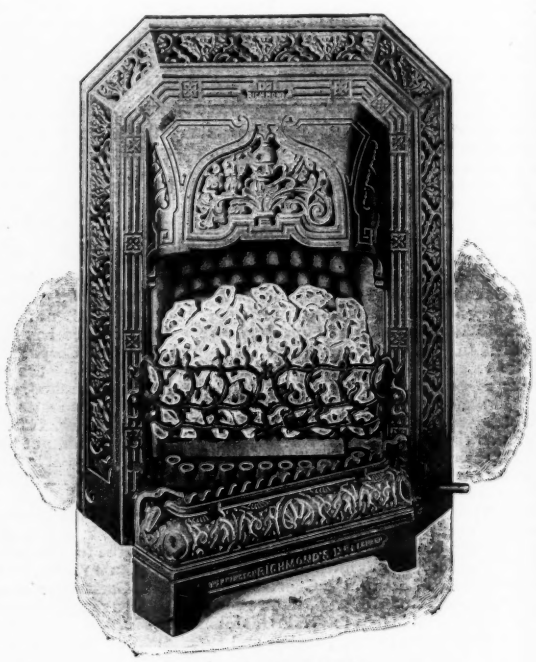
Tar Products.

There is very little change to report in the market generally, prices, as a rule, remaining stationary. Pitch is, however, very quiet, especially for forward delivery. A fairly good business was done in South Wales during the past week; but so far as the Continent is concerned, matters are quiet, and buyers are holding off in the hope of lower prices ruling later on, although very few of them appear to be covered for next year. In benzol, 90 per cent. continues in good demand, especially for prompt delivery; but 50-90 per cent. is rather neglected. The demand for solvent is certainly better for both the heavy and ordinary qualities, and during the past week several Continental inquiries have been received for same. Crude carbolic is still in very good demand for prompt and forward delivery, particularly from the Continent; but English consumers are holding off the market.

RICHMOND'S

GAS-FIRES

Swing Fender.



The "RICHMOND."

Removable Burner.

THE RICHMOND Gas Stove & Meter Co., Ld.,

WORKS { ACADEMY STREET, WARRINGTON. CARPENTERS ROAD, STRATFORD.

Crystals are still dull, and prices remain low. Creosote is in good demand, especially for export, and most of the London makers are fully sold. There is a slightly improved inquiry for toluol. The position of anthracene remains unchanged; and very little business is doing. In tar, prices have rather a downward tendency, the dullness which prevails in pitch rendering makers very cautious as to paying high prices.

The average values during the week were: Tar, 23s. 6d. to 30s. Pitch, London, 50s. to 50s. 6d.; east coast, 48s. 6d. to 49s.; west coast, 48s. to 48s. 6d. Benzol, 90 per cent., 10d.; 50-90 per cent., 7½d. to 8d. Toluol, 7d. to 7½d. Crude naphtha, 3¼d. to 3⅜d.; solvent naphtha, 8¼d. to 9d.; heavy naphtha, 9¼d. to 11d. Creosote, London, 1⅝d. to 1 1/16d.; North, 1⅜d. to 1½d. Heavy oils, 2⅛d. to 2¼d. Carbolic acid, 60 per cent., 1s. 6d. Refined naphthalene, £5 to £8. Salts, 25s. to 27s. 6d. Anthracene, "A" quality, 1¾d. to 1⅞d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market is decidedly quiet, especially for prompt delivery. Beckton now quote £12 7s. 6d. for prompt, but maintain their quotation of £12 15s. for forward; while the South Metropolitan Company are reported to have sold at £12 15s. for November delivery. In Hull, the market is easier; and £12 2s. 6d. to £12 3s. 9d. is the ruling price. In Leith, there is little or no business doing. Small sales are reported at from £12 3s. 9d. to £12 5s. for prompt delivery; but makers ask £12 10s. for January-June. In Liverpool, there is no business to report. Some small parcels have been placed at £12 6s. 3d. for early delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Except that gradually increasing inquiry is coming forward for engine classes of fuel with resuming operations in the cotton trade, there is no improvement of a general character with regard to any descriptions of round coal. House-fire requirements remain much below the average for the time of the year. The continued unsatisfactory condition of the iron and engineering trades and other large coal-using industries also restricts the demand upon the lower descriptions of round coal used for steam and forge purposes. As a result, pits have still to be kept on short time; and it is exceptional where they are running more than four days per week. But even this restriction of output does not prevent a good deal of surplus coming upon the market, which is frequently pushed for clearance sale at very low-cut figures. This has a weakening effect upon price, although the list basis rates remain without quotable change. Best Wigan Arley coals are still quoted 13s. 6d. to 14s. 6d. per ton at the pit, seconds Arley and Pemberton four-feet 11s. and 11s. 6d. to 12s. 6d., and common house-fire coals from 9s. 6d. to 10s. 6d. Steam and forge descriptions range very low; and it is only for some of the special sorts where actual selling prices much exceed 7s. 9d. to 8s. 3d. per ton at the pit. Collieries naturally resort to shipping orders to get rid of surplus output, as in this way it is taken off the home market. Some low-cut quotations are made to secure cargoes; common steam coals in special cases being sold under between 8s. 6d. and 8s. 9d. per ton, while ordinary quotations are about 9s. 3d. to 9s. 6d. delivered at the ports on the Mersey. Of engine fuel, although the increased inquiry is taking off generally what Lancashire collieries are raising, there are still abundant supplies from other districts, and no better prices are being got. Common slacks range from about 4s. to 4s. 6d. per ton at the pit, medium 5s. to 5s. 6d., and best slacks 5s. 9d. to 6s. 3d. and 6s. 6d.

Northern Coal Trade.

There is a steady demand for coals, but without much pressure; the end of the Baltic season having materially reduced the inquiry for steam coals, though there is an enlarged consumption of some other kinds of fuel. Best Northumbrian steams are more plentiful, and the price for prompt delivery is now about 10s. per ton f.o.b., second-class steams are 8s. 9d. to 9s., and steam smalls are 5s. per ton. In the gas coal trade, there is a decided enlargement of the demand, and deliveries are well met—the ample supply of steamers allowing the larger needs to be dealt with. Prices of Durham gas coals vary, according to quality, from 8s. 3d. to 8s. 10½d. per ton f.o.b.; while a few contracts for export have been renewed at a reduction of about 6d. per ton from those of the expiring contracts. Gas coke, being now more plentiful, is quieter on the whole, more especially at the inland gas-works. Works which can export are able in some instances to quote about 14s. 6d. per ton f.o.b. for good gas coke.

Scotch Coal Trade.

Trade is showing some sign of improvement, but not sufficient to affect prices. The demand and the output are pretty fairly balanced, so that stocking is not going on to any extent. While this is so, forward orders are not so plentiful as coalowners would wish. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 6d. to 9s. 6d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 242,191 tons—an increase of 12,892 tons over the previous week, but a decrease of 26,792 tons upon the corresponding week last year. For the year to date, the shipments have been 9,129,643 tons—an increase of 216,711 tons upon the same period of last year.

Lambeth Water-Works Company.—The Directors of this Company have decided, subject to audit, to recommend the payment of a dividend on the 10 and 7½ per cent. stock for the past half year at the prescribed rates, with the addition of 1 per cent. per annum on account of deficiencies of previous dividends. The undivided profit (including the balance of the contingency fund) carried forward will amount to £45,700, after providing for the statutory payment to the Chamberlain of London's sinking fund.

PARKINSON'S

EMBODIES MANY IMPORTANT IMPROVEMENTS

"CROWN" COOKER

PARKINSON AND W. & B. COWAN, LTD.

(*Parkinson Branch*)

LONDON AND BIRMINGHAM.

Gas Testing at West Ham.—The West Ham Corporation having requested the West Ham Gas Company to provide at the new gas-testing station a burner similar to that prescribed for use in the Metropolis, a letter was read at the meeting of the Town Council, on Tuesday, in which the Company offered to provide a Referees' burner on the photometer as required, but stated that it would be necessary with it to burn gas at the rate of at least 6·5 cubic feet per hour when testing. Upon the report of the Gas Examiner and the recommendation of the Highways Committee, it was decided not to accept the Company's offer.

Gas-Works Flooded in Cornwall.—Among the towns which suffered from the tremendous downpour of last week were Bodmin and Lostwithiel. In both the rainfall on Tuesday was a perfect deluge, and flooding was general. At Bodmin, the storm water of the town is carried away by a stream which flows by the railway station. This stream overflowed, inundated the station till it covered the platforms, and eventually found its way into the gas-works, which are close by. In order to keep down the flood and prevent the inconvenience of the make of gas being stopped, the fire-engines were brought out, and kept pumping for several hours. By this means the danger was averted; but the staff were put to much trouble and inconvenience, and the works were covered with a coating of mud and slime. At Lostwithiel, the conditions were even worse, for there the gas-works were flooded to such a depth that it was impossible to continue operations; and on Tuesday night the town was in darkness. When the rain stopped, the water gradually subsided; but in both Bodmin and Lostwithiel a great amount of labour was thrown on the officials and workmen in restoring the things to something like normal conditions.

Progress of the Langsett Reservoir at Sheffield.—In reply to certain inquiries made on behalf of Rotherham and Doncaster, their representatives have been informed by the Sheffield Water Committee that it is anticipated that the Committee will be in a position to close the valves of the Langsett reservoir, and so begin to impound water therein, in the early autumn of 1904.

Fresh Issues of Gas and Water Capital.—At the Mart, Tokenhouse Yard, E.C., on Tuesday, Mr. Alfred Richards sold 5 per cent. perpetual debenture stock of the Croydon Gas Company, at £123, £123 10s., and £124 per £100 of stock; 5 per cent. ordinary stock of the South Essex Water Company (last dividend on similar stock 4 per cent.), at £101 to £102 10s. per £100 of stock; 4 per cent. perpetual debenture stock of the Aldershot Gas and Water Company, at £100 and £100 10s.; and fully-paid £10 "B" shares in the Grays Gas Company (last dividend £5 5s. per cent. per annum), at par. The foregoing were all new issues, by order of the Directors of the respective Companies.

Colonial Gas Association, Limited.—The Directors' report for the twelve months ending last June, which is to be presented to the shareholders at the annual meeting of the Association to-day, states that there has been an average increase of 5¾ per cent. in the consumption of gas. The accounts, after writing off £500 for depreciation on works, show a profit of £5165, from which amount the sum of £1268 was paid as an interim dividend in April last; and after providing for interest on debentures, &c., to June 30, there remains a balance, including the amount brought forward from 1902, of £3109. The Directors recommend a dividend for the second half of the year at the rate of 6 per cent. per annum, free of income-tax (making 4½ per cent. for the year), which will absorb £2543; leaving a balance of £566 to be carried forward to the next account.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

CHEMIST. No. 4115.
WORKING GAS MANAGER. Forster, Malvern.
WORKING MANAGER. Colwall Gas-Works.
WORKING MANAGER. Mountain Ash Gas Department. Nov. 24.
WORKING MANAGER. No. 4116.
WORKING MANAGER. No. 4118.
WATER-WORKS MANAGER. No. 4114.
SLOT-METER COLLECTOR. No. 4117
GAS-FITTER. Waltham Cross Gas-Works.

Situations Wanted.

GAS-STOVE TRADE. No. 4119.
TRAVELLER GAS APPARATUS MANUFACTURERS. No. 4111.

Agents Wanted.

"GAS-WORKS," c/o Street's, London.

Plant for Sale.

GAS-ENGINE (80-Horse Power). Brymbo Steel Works.
GAS-ENGINE, EXHAUSTERS, &c. Normanton Gas Company.
HYDRAULIC MAIN, MOUTHPIECES, STEAM-BOILER, CONDENSER, SCRUBBERS, PURIFIERS, STATION METER GASHOLDER, GOVERNOR, &c. Newport (Fife Gas-Works.
HYDRAULIC MAIN, SCRUBBER, STATION METER, GOVERNORS, RETORT, EXHAUSTER CONNECTIONS, STEAM-BOILER, &c. Swadlincote Gas Department.
STATION METER (1500 Feet). Shepshed Gas-Works.

Plant Wanted.

SCRUBBERS. Widnes Gas-Works.

Sales of Stocks and Shares.

LEATHERHEAD GAS AND LIGHTING COMPANY. Nov. 11.
YORK TOWN AND BLACKWATER GAS COMPANY. Nov. 11.

Meeting of Company.

PORTSMOUTH WATER-WORKS COMPANY. Portsmouth, Nov. 26, Three o'clock.

TENDERS FOR

Fire-Clay Goods.

BRADFORD GAS DEPARTMENT. Tenders by Nov. 12.
BURTON-ON-TRENT GAS DEPARTMENT. Tenders by Nov. 24.
NELSON GAS DEPARTMENT. Tenders by Nov. 18.

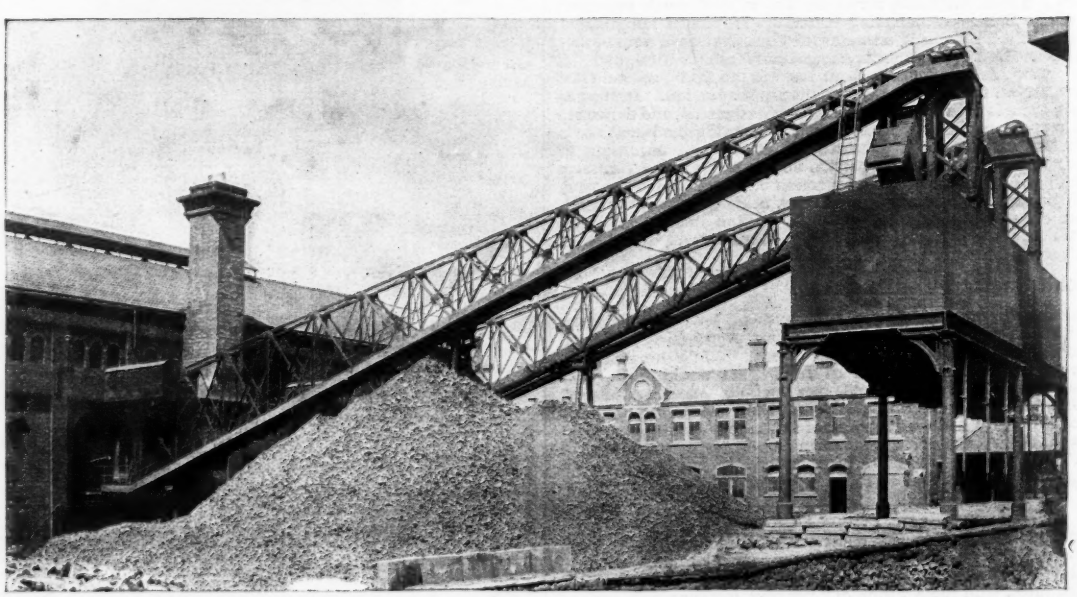
Retorts.

BRADFORD GAS DEPARTMENT. Tenders by Nov. 12.

THE

DE BROUWER PATENT HOT COKE CONVEYOR

GUARANTEED BY SOLE MAKERS.



W. J. JENKINS & Co., LIMITED, RETFORD.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS.

Correspondence invited.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,

VICTORIA PAINT WORKS,

MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.

Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore,
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.

Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.

Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers.

Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

MANTLE ASHES.

THE Highest Price in the Market for MANTLE ASHES is paid by Messrs. OBERFELT AND CO., BERLIN, ENGEL UFER 1b., MANUFACTURERS OF MANTLES and Buyers of any quantity of ASHES.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

A GAS ENGINEER, well-known in the Industry, seeks position as TRAVELLER to Engineering Firms and Gas Apparatus Manufacturers. Speaks and corresponds in French and Italian.

For further Information, please apply (by letter) to No. 4111, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-STOVE TRADE.

ADVERTISER (Age 36), Twenty Years' Experience in the Trade, desires an ENGAGEMENT as WORKS MANAGER, or similar post, or would undertake management of Gas Company's Show-Rooms, &c.

Address No. 4119, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WATER-WORKS MANAGER.

WANTED, by a Water Company, at present supplying a population of about 50,000 persons, a thoroughly competent MANAGER, with practical knowledge of Machinery and all matters relating to the Management and Control of a Water-Works Undertaking. Must have occupied a similar position before. Age not to exceed 45 years. Commencing Salary, £300 per annum.

Apply, by letter, stating References, &c., to No. 4114, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd. (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.

General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11 Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

WORKING Gas Manager wanted for the Colwall Gas Company. Wages 25s. per week, with good House, Coal, Gas, and Rates, free.

Apply, by letter, to G. H. FORSTER, Solicitor, MALVERN.

AGENTS wanted for a Speciality to be sold to Gas-Works and Chemical-Works. Liberal Commission.

Applications to be addressed, in first instance, to "GAS-WORKS," care of Street's, 30, Cornhill, LONDON.

WANTED, a good Gas-Fitter, used to Service Laying, and Fixing Gas Engines, Stoves, Meters, and Incandescent Burners.

Apply, by letter, with *copies* of Testimonials, stating Age, &c., to the MANAGER, Gas-Works, Waltham Cross, LONDON, N.

WANTED, a Working Manager for a Gas-Works in the Midlands. Annual make, 4 Million cubic feet. Wages 30s. per week. Capital House, Coals, and Gas.

Apply, by letter, to No. 4116, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHEMIST Wanted. Must be well-trained, with Works Experience, and with special knowledge of Gas Manufacture, Condensing, and Washing. Good position for suitable Man.

Apply, by letter, to No. 4115, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager for a Gas-Works on the South Coast. Make about 2½ million cubic feet per annum. Cottage (only) provided.

Apply by letter, stating Age, References, and Wages required, to No. 4118, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a large Provincial Gas and Water Company in the South of England, a Smart Young Man, of Steady Habits and Good Constitution, to act as COLLECTOR AND INSPECTOR on Slot Meters. Necessary to wear Company's uniform cap. An educated man preferred, who would be able to take a better position in Office in due course, should a vacancy occur.

Application, in own handwriting, stating Experience and present Position, together with *copies* of Three recent Testimonials, to be sent in not later than November 12. Wages as Slot Collector to commence at 26s., rising to 30s., if satisfactory, in two years.

Address No. 4117, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MOUNTAIN ASH URBAN DISTRICT COUNCIL.

WORKING GAS MANAGER.

THE Council invite Applications for the Appointment of a qualified WORKING GAS MANAGER, to act under the direction and supervision of the Surveyor to the Council.

Salary £130 per Annum, with House, Coal, and Gas.

The Annual Make of the Works is about 32 million cubic feet.

Applicants must be between 25 and 40 years of Age, and have had previous Practical Experience in the Management and Charge of Gas-Works.

Applications, endorsed "Working Gas Manager," stating Age and Experience, and accompanied by *copies* of Three recent Testimonials as to character and competency, to be addressed to me so that they be received not later than Twelve noon on Tuesday, the 24th of November.

Canvassing, either directly or indirectly, will be a disqualification.

By order,
H. P. LINTON,
Clerk to the Council.

Town Hall, Mountain Ash,
Oct. 31, 1903.

COAL GAS TAR wanted.

Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL,

5, CROOKED LANE, LONDON, E.C.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

WANTED, two second-hand Scrubbers. One suitable for Works of 25 million cubic feet, and one for Works of 15 millions.

Prices and Particulars to ISAAC CARR, WIDNES.

24-INCH VALVES, Tees, Bends, CROSSES, &c., Second-Hand, FOR SALE Cheap. In Good Condition. Makers, Newton Chambers.

Apply to DUXBURY & CO., MANCHESTER.

1500 Feet Cowan Station Meter, with 4-inch Connections and Bye-Pass Valves, in Good Working Order, FOR SALE.

SHEPSHED GAS-WORKS, LEICESTERSHIRE.

TO BE SOLD—Gas Valves (Six Screw) by Walker, 16 in. diameter; also Six RACK and PINION, by Donkin, same size. Equal to new.

GASHOLDER, 22 feet by 10 feet, with Steel Tank. Self contained.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

FOR SALE—A Crossley Gas-Engine, about 80-Brake Horse Power, suitable for Electric Lighting. The Engine is complete, including several spare parts, and is in first-rate condition. Price £250 f.o.r. for immediate Sale.

Engine can be inspected at the Works of the BRYMBO STEEL COMPANY, LIMITED, near WREXHAM.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

NORMANTON GAS COMPANY.

PLANT FOR SALE.

OFFERS wanted for—

Crossley's GAS-ENGINE, 4-Horse Power.
Holmes EXHAUSTER, 10,000 Cubic Feet per hour, with Two 9-inch Rack-Valves and Connections.
Donkin's EXHAUSTER, 15,000 cubic feet per hour, with Valves and Connections.

All in thorough good order.

Apply to E. H. HUDSON, Secretary and Manager.

THE Newport (Fife) Town Council, having now shut down their old Works, have the following GAS PLANT FOR SALE, all of which are in Good Condition—viz.:

Cast-Iron HYDRAULIC MAIN, 27 feet long, in Three Sections.
Twelve ⌂ MOUTHPIECES, with Ascension-Pipes and Bends.
One Horizontal STEAM-BOILER, 9 ft. by 3 ft., complete with Safety Valve.
One Six-Horse Power Horizontal STEAM-ENGINE.
Atmospherical Vertical CONDENSER, Pipes 18 ft. by 7 in.; chest, 12 ft. by 2 ft. by 1 ft. 6 in.
One Young's SCRUBBER, 9 ft. 6 in. high by 6 ft. Diameter, with 7-inch Connections.
One Cast-Iron SCRUBBER (with perforated Plates), 18 feet high by 4 feet square.
Two PURIFIERS, 10 feet by 8 feet, complete with 7-inch Four-Way Valves and Connections.
CYLINDRICAL STATION METER.
One Single-Lift GASHOLDER, 42 feet by 16 feet deep, with Cast-Iron TANK
One Single-Lift GASHOLDER, 33 ft. by 12 ft. deep, with Cast-Iron TANK.
One Station GOVERNOR, with 7-Inch Connections.

Sealed Tenders, endorsed "Tender for Gas Plant," to be delivered to John Scrimgeour, Esq., Town Clerk, not later than the 11th of November, 1903.

The Plant can be seen by appointment with, and further Information obtained from,

JOHN F. BLACK,
Manager.

Gas-Works, Newport, Fife,
Oct. 27, 1903.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.

Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

TO BE SOLD Cheap:—

Two (18 inch) SQUARE STATION METERS, new drums.
TOWER SCRUBBERS from 3 ft. 6 in. up to 12 feet diameter, in pairs or singly.
Patent WASHERS, 8-inch, 10-inch, and 12-inch, by "Holmes," "Kirkham," "Walker," and "Livesey."
EXHAUSTERS, patent type, from 2000 to 100,000 cubic feet per hour.
CONDENSERS, RETORT IRONWORK, GAS-HOLDERS, STEEL TANKS.

Every description of New and Second-Hand Gas Plant made and supplied.

Inquiries solicited by J. FIRTH BLAKELEY and Co., Thornhill, DEWSBURY.

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL

(GAS DEPARTMENT)

HAVE the following for Disposal, in One Month, as a whole or in part.

Four lengths of Wrought-Iron U-shaped HYDRAULIC MAIN, 18 in. by 18 in., for 33 Retorts.
Wrought-Iron SCRUBBER, 4 ft. by 15 ft.
Cylindrical STATION METER, with 8-inch Inlet, Outlet, and Bye-Pass Valves and Connections, 10,000 cubic feet per hour.
One ⌂ CLAY RETORT, 21 in. by 16 in. by 9 ft.
8-inch Inlet and Outlet EXHAUSTER CONNECTIONS, with Bye-Pass Complete, for Two Exhausters.
One Vertical STEAM-BOILER, 6 ft. by 2 ft. 6 in., insured to 50 lbs., with Safety-Valve complete.
One STATION GOVERNOR, with 8-inch Inlet, Outlet, and Bye-Pass Valves and Connections complete, by George Orme & Co.
One STATION GOVERNOR as above, 8-inch Connections, by Alex. Wright & Co.

All the above are in good working order.

Further Information from, and Tenders (endorsed) to
G. B. SMEDLEY,
Engineer.
Gas-Works, Swadlincote.

BOROUGH OF NELSON.

FIRE-CLAY GOODS.

THE Gas Committee invite Tenders for the supply of FIRE-CLAY GOODS for the Season 1904.

Specification and Form of Tender may be obtained on application to Mr. A. J. Hope, Engineer and Manager, Gas-Works, Nelson.

Tenders, endorsed "Fire-Clay Goods," to be sent to the undersigned not later than Nov. 18.

The Committee do not bind themselves to accept the lowest or any Tender.

J. H. BALDWICK,
Town Clerk.
Town Hall, Nelson,
Oct. 29, 1903.

BOROUGH OF BURTON-UPON-TRENT.

FIRE-CLAY GOODS.

THE Gas and Electric Light Committee invite TENDERS for the supply of the FIRE-CLAY RETORTS, BRICKS, and CLAY required at the Gas-Works during the Year 1904.

Full Particulars of the Specification and Conditions, with Form of Tender, may be obtained on application to the undersigned, to whom sealed Tenders, endorsed "Fire-Clay Goods," must be delivered on or before Tuesday, the 24th day of November current.

The lowest or any Tender will not necessarily be accepted.

F. L. RAMSDEN,
Manager and Engineer.
The Gas-Works,
Burton-upon-Trent, Nov. 2, 1903.

TO RETORT MANUFACTURERS.

THE Bradford Corporation are pre-pared to receive TENDERS for the supply of RETORTS, and of FIRE-BRICKS and FIRE-CLAY required in the fixing of such Retorts, during the Year 1904.

Form of Tender may be obtained on application at the Gas Engineer's Office, Town Hall, Bradford.

Tenders, endorsed "Tender for Retorts," to be sent to me so as to arrive on or before Thursday, the 12th of November next.

The contract will be let subject to the Fair Contracts Clauses of the Corporation, which may be seen at the Town Clerk's Office, and which the accepted Contractor will be required to sign.

The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.
Town Hall, Bradford,
Oct. 29, 1903.

LEATHERHEAD GAS AND LIGHTING COMPANY.

NOTICE is Hereby Given of a Sale by TENDER of 250 SHARES of £10 EACH, being a portion of the Additional Share Capital authorized to be raised in pursuance of the Powers of the Leatherhead Gas Act, 1901.

No Tender will be received after Eleven a.m. on Wednesday, the 11th of November, 1903.

The last Dividend paid was at the rate of 4½ per cent. per annum, free of income-tax.

Forms of Tender can be obtained on application to the Secretary.

By order,
JOHN YOUNG,
Secretary.
North Street, Leatherhead,
Oct. 26, 1903.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

NOTICE OF HALF-YEARLY MEETING.

NOTICE is Hereby Given, that the next HALF-YEARLY MEETING of the Shareholders in this Company will be held at the Company's Offices, Commercial Road, Portsmouth, on Thursday, the 26th day of November, 1903, at Three o'clock in the Afternoon, on the following Business:—

To receive the Accounts and Balance Sheets to the 30th of September last, and the Directors' Report.
To declare Dividends.
And for the transaction of the other Ordinary Business of the Company.

The REGISTER OF TRANSFERS WILL BE CLOSED on and after the 19th day of November, 1903, until after the Meeting.

Dated the 29th day of October, 1903.

By Order of the Board of Directors,
J. L. WILKINSON,
Secretary to the Company.

YORK TOWN AND BLACKWATER GAS AND COKE COMPANY, LIMITED.

ISSUE OF £2 10s. SEVEN PER CENT. "ADDITIONAL" SHARES.

SALE BY TENDER OF 1360 £2 10s. SEVEN PER CENT. "ADDITIONAL" SHARES, in pursuance of the Provisions of the York Town and Blackwater Gas Orders, 1890 and 1899.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER 1360 £2 10s. "Additional" Shares of £2 10s. each (the standard dividend on which is Seven per cent.), to be paid up in full on or before the First day of December, 1903.

Particulars and Conditions of Tender may be obtained at the Company's Office, York Town, Surrey, or of the Secretary, as under.

Sealed Tenders must be sent to the Secretary not later than Wednesday, the 11th day of November, 1903.

By Order,
SIMEON ROWE,
Secretary.
The Gas-Works, York Town, Surrey.
Oct. 17, 1903.

YORK TOWN AND BLACKWATER GAS AND COKE COMPANY, LIMITED.

ISSUE OF TWENTY-FIVE £50 DEBENTURES, Bearing Interest at 4 per Cent. per annum.

NOTICE is Hereby Given, that the Directors of the above Company, in pursuance of the Provisions of the York Town and Blackwater Gas Orders, 1890 and 1899, have decided to issue Debentures of the Company to the extent of £1250, bearing Interest at 4 per cent. per annum, and payable half yearly.

Forms of Application, which may be obtained at the Company's Office, York Town, Surrey, or of the Secretary, as under, must be returned to me not later than Wednesday, the 11th day of November, 1903.

By Order,
SIMEON ROWE,
Secretary.
The Gas-Works, York Town, Surrey.
Oct. 17, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

Now Ready, Price 15s., Limp Cloth,

— TWENTY-THIRD YEAR —

AN

ANALYSIS OF THE ACCOUNTS

OF THE

METROPOLITAN WATER COMPANIES

(Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex)

AND OF THE

CORPORATION WATER UNDERTAKINGS

OF

EDINBURGH, GLASGOW, & MANCHESTER.

FOR THE YEAR 1902-1903.

Compiled by

WOOD, DREW, & CO.,

Chartered Accountants.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THE

PETROLEUM GAS SYNDICATE

Supply and erect Complete Installations of their

PETROGENE PATENT GAS PLANT

On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

Offices: **28, Victoria St., Westminster.**
Works: **10, Rochester Row, S.W.**

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THE

"ROTARY"

STATION METER.

Efficiency Demonstrated.

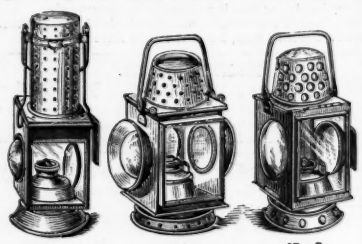
APPLY—

T. G. MARSH,

MAWSON CHAMBERS, DEANSGATE, MANCHESTER.

ARMSTRONG'S PATENT

CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

WELDON MUD

FOR

GAS PURIFICATION,

For use in the

RECOVERY OF SULPHUR,

Also Removal of last Traces of

SULPHURETTED HYDROGEN

in catch position.

Full Particulars on application to the Patentees:

GAS DESULPHURIZATION CO.,

— LIMITED, —

1, FENCHURCH AVENUE, LONDON, E.C.

INCLINED RETORT-HOUSE

AT THE

CHESTERFIELD GAS-WORKS

166 ft. 9 in. long, 52 feet wide, 46 feet high.

This House when finished will contain 12 Beds of Sevens.

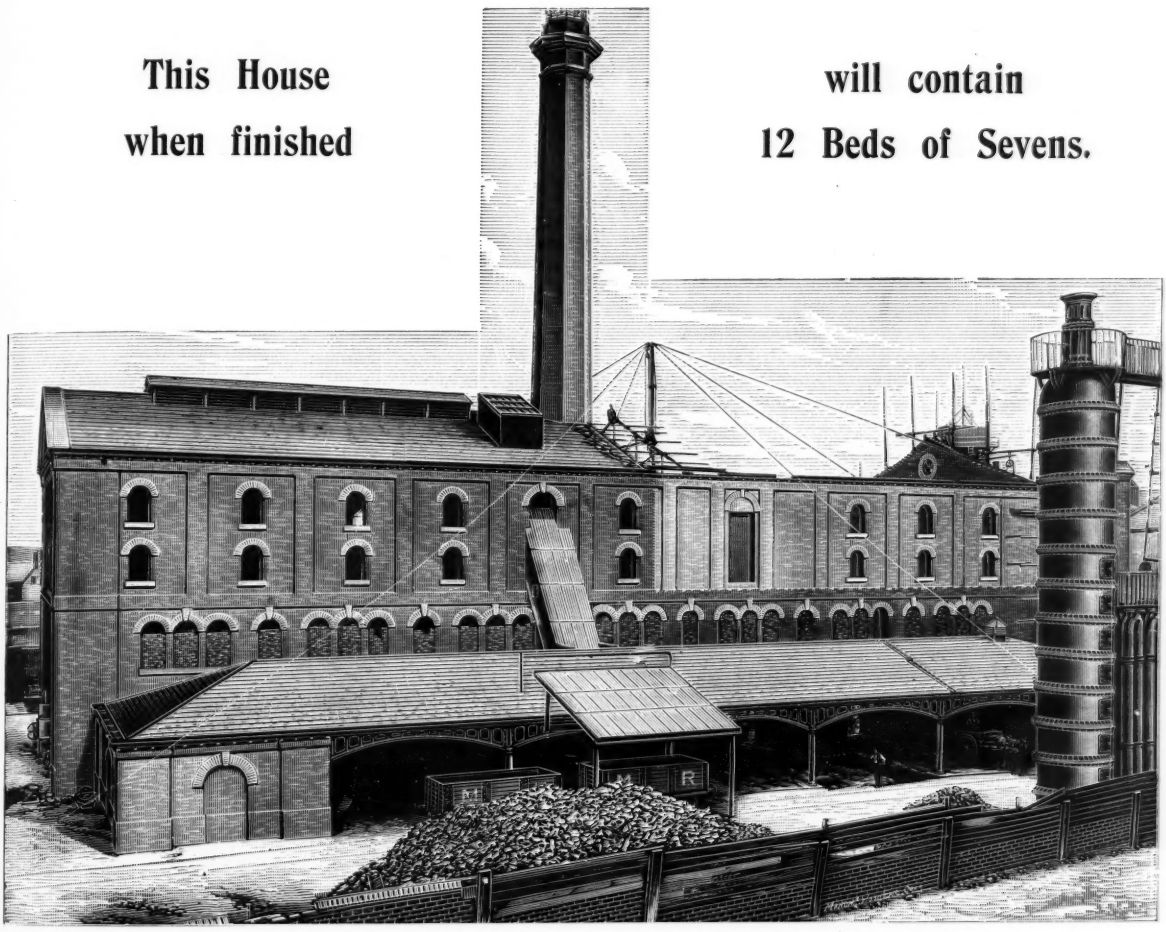


Photo. showing state of Work 7 WEEKS after receiving REPEAT Order for 6 complete Arches and Extension to Building.

NO SUB-CONTRACTING.

CONTRACTORS:

R. DEMPSTER & SONS, LIMITED.

ELLAND.

Printed for Walter King by King, Sell, & Olding, Ltd.; and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Nov. 3, 1903.

FIRE

GOLD MEDAL FOR FIRES AWARDED 1903.

GOLD MEDAL FOR COOKERS AWARDED 1903.

That will satisfy your most fastidious Customer.

BRILLIANT. WARM. NOISELESS.

Send small Sample Order.
Your further Orders will follow.

THE IMPERIAL STOVE CO., LEAMINGTON SPA.

Telegrams: "Imperial, Leamington."
Telephone: One X.

HEATHCOTE GAS COAL.

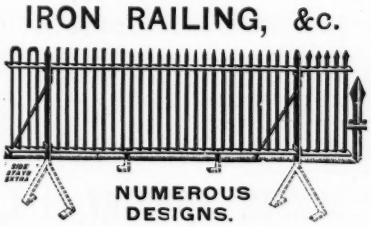
Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke. Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD., CHESTERFIELD.

BAYLISS.

JONES, AND BAYLISS LIMITED,
Manufacturers of

IRON RAILING, &c.



NUMEROUS DESIGNS.

COKE-BARROWS.

LISTS FREE.

BAYLISS, JONES & BAYLISS. WOLVERHAMPTON,
And 139 & 141, Cannon St., London, E.C.

PATENT FLEXIBLE SLIDING PENDANT.

ANTI-VIBRATING.

(Helps' Patent.)

Specially Designed for Incandescent Burner for use in Factories, Mills, &c.

Harp "B" for Nos. 1 and 2 Kern Burners or "C" or "York" Burners.

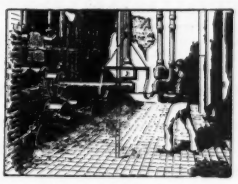
For Resisting Shock or Vibration, there is no better medium than **Flexible Metallic Tubing.** All its advantages are secured in this Pendant.

JAMES MILNE & SON,
LIMITED,
EDINBURGH & LEEDS,
LONDON & GLASGOW.

ATTERTON'S

CHARGING APPARATUS

Nearly **40** of these Machines have been



supplied to English Gas-Works.

Sole Agents for the United Kingdom:

E. PADFIELD & CO.,
96 & 98, LEADENHALL STREET, E.C.

Representatives:
Messrs. BELL & CO., Engineers, CARDIFF,
Mr. J. B. MACDERMOTT, GLASGOW, and
J. BYRON MACKENNA, DUBLIN.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

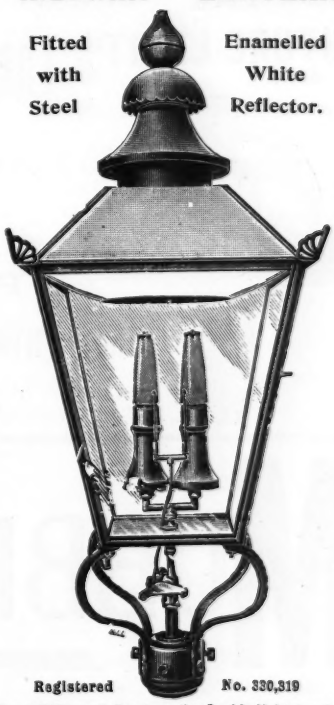
GEORGE WALLER & SON,
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD, GLOUCESTERSHIRE.

THE

"KILBURN" LANTERN.

Fitted with Steel

Enamelled White Reflector.



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The "Kilburn" Lantern (for double lights) and "St. Albans" Lantern have been adopted for light the Town of St. Helens.

H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1693 HOP.
Telegrams: "LUMINOSITY LONDON."

TROTTER, HAINES, & CORBETT, LIMITED,

Brettell's Estate

FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS-RETORTS GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to **Mr. EDWARD PRICE,** "Langley," Wyke Avenue, **WORTHING.**

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY

RAVENSTHORPE, NEAR DEWSBURY.

THE PERFECT MANTLE COY.,

1c, Aldgate Avenue, London, E.C.

MANUFACTURERS OF THE WELL-KNOWN

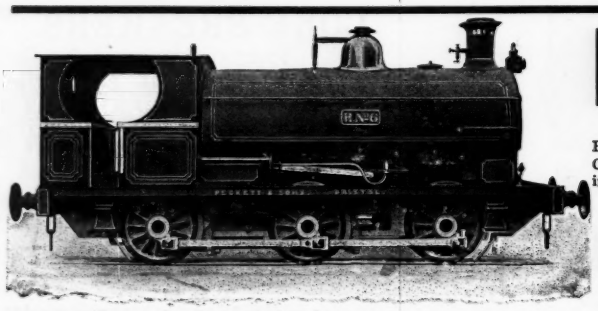
SUPERIOR "PERMCO"

MANTLE, IN COTTON AND RAMIE.

Under Welsbach Licence. Can be used legally with any Burner.

Trade Price 26s. 6d. per Gross.

Reduction for Quantities.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

THE

FUTURE LIGHT!

The Latest Novelty in Gas Lighting is

The "STAR" Patent Inverted Incandescent Burner.

THE ONLY BURNER BUILT ON SCIENTIFIC PRINCIPLE.

A Brilliant Light of about **70-Candle Power,** with a consumption of **2½ cubic feet per hour,** with a 1-inch Mantle.

Owing to the shortness of the Mantle, it is guaranteed to **last longer** and **burn brighter** than any other Mantle on the Market.

PRICE: Burner, Mantle, and Globe 6s. Subject.

The "STAR" INVERTED INCANDESCENT BURNER COMPANY, Ltd.,

59a, FARRINGDON ST., LONDON, E.C.

Telephone No. 5179 HOLBORN. **SEND FOR LIST.** Telegraphic Address: "INVERTAMUS, LONDON."

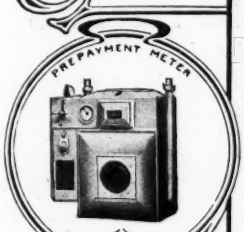
MOBBERLEY & PERRY

Stourbridge,

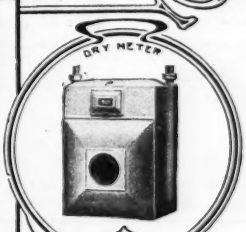
Are being entrusted with **LARGE REPEAT ORDERS** for Home and Abroad for INCLINED and HORIZONTAL RETORTS

CONSEQUENT UPON THE "A1" QUALITY THEY SUPPLY.

R. LAIDLAW & SON,
LIMITED
GAS & WATER ENGINEERS,



SIMON SQUARE WORKS, EDINBURGH.



6 LITTLE BUSH LANE, LONDON, E.C.

TWO STATION METERS EACH TO PASS 200000 CUB. FT PER HOUR. ERECTED AT THE

GRANTON GAS WORKS FOR THE EDINBURGH & LEITH GAS COMMISSIONERS.

ALLIANCE FOUNDRY & ENGINEERING WORKS, GLASGOW.

Telephone No. 756 Bank. *Telegraphic Addresses: "Robustness," London; "Water," Goring.*

J. & H. ROBUS,
ENGINEERING CONTRACTORS
FOR THE ERECTION OF
COMPLETE GAS AND WATER WORKS.

MAINLAYING.

RECONSTRUCTING EXISTING WORKS.

Speciality.—Carbonizing Engineers. *Retort-Houses Built and Equipped.*

We guarantee these eminent—

"REMIND." SETTINGS, "ROBUS."
INCLINES complete with
HORIZONTALS, CONVEYORS,
GENERATORS, ELEVATORS,
FLOOR LINES,
INCREASING OUTPUTS.

CHIEF OFFICE: 20, BUCKLERSBURY, LONDON.

THE GEORGE FISCHER STEEL & IRON WORKS, LTD.,
20, High Holborn, London, W.C.
MAKERS OF THE
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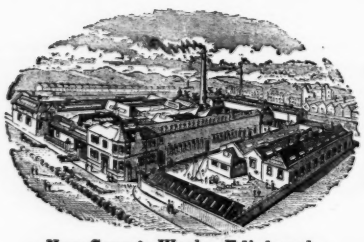

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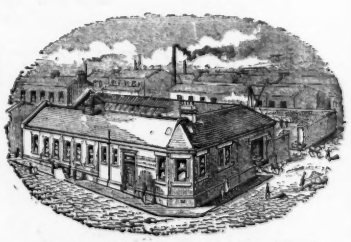

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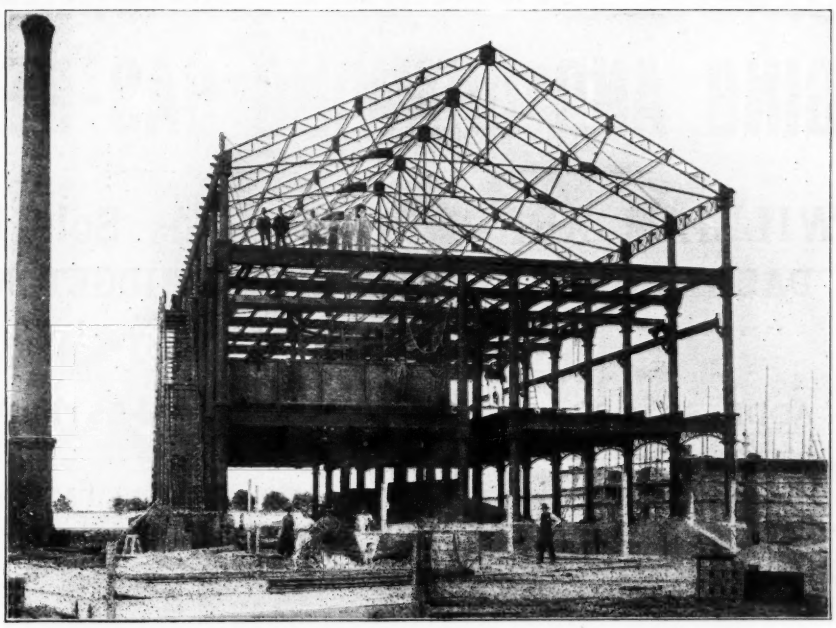

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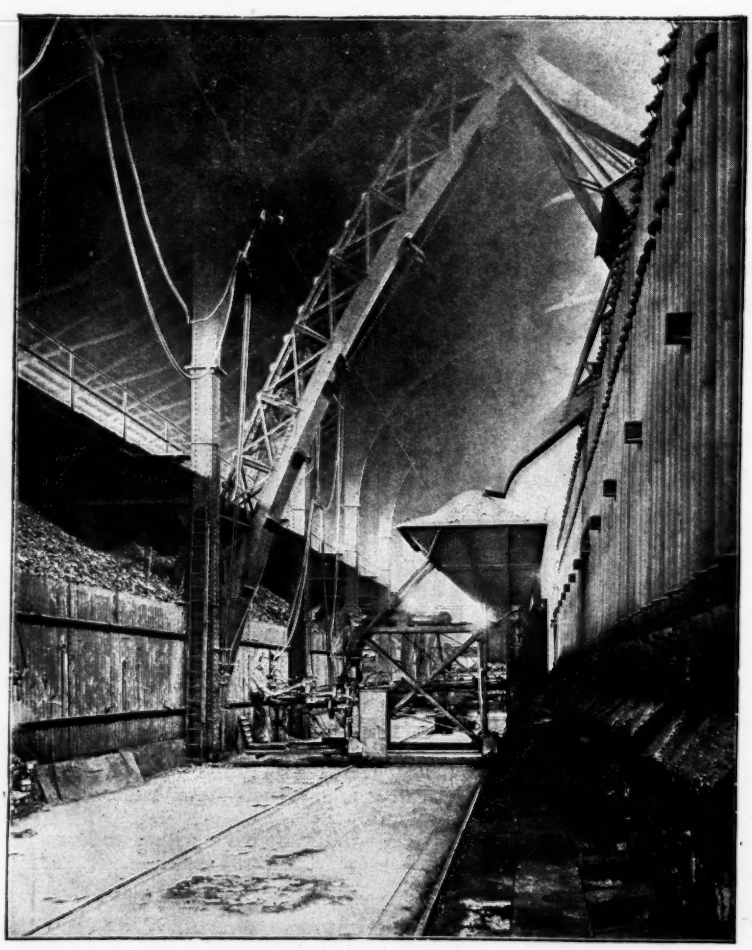

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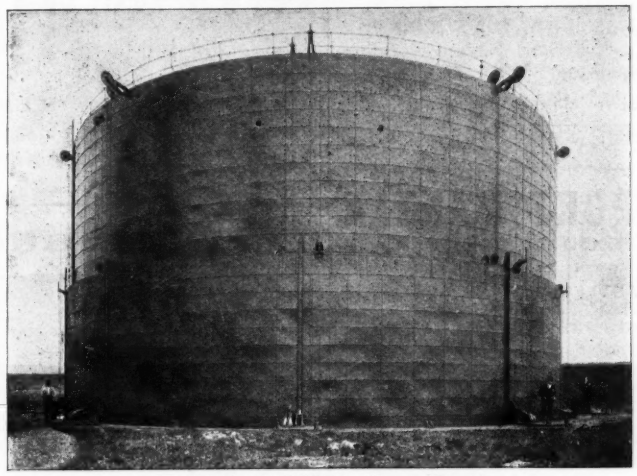

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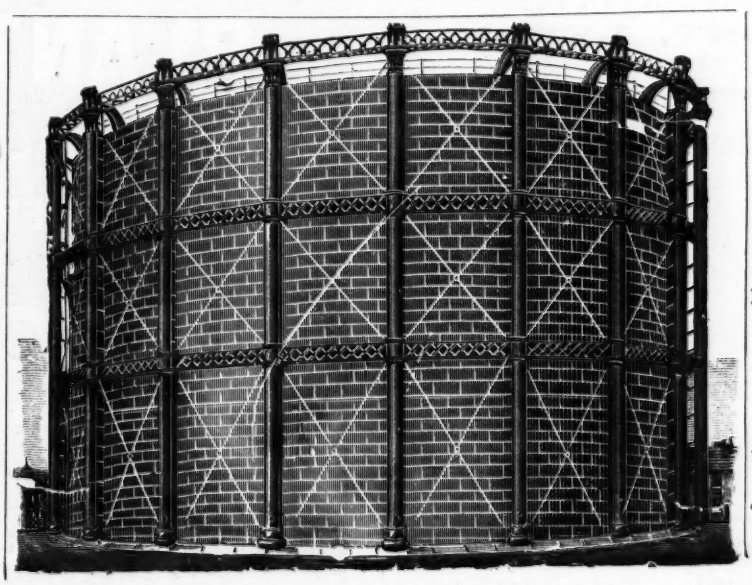

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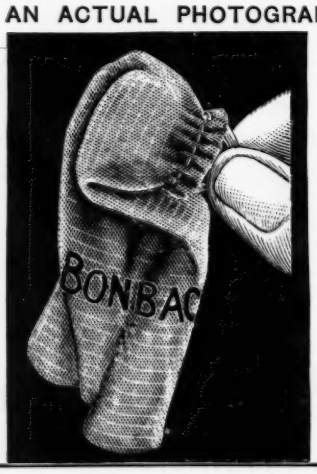

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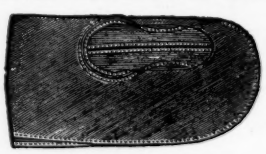

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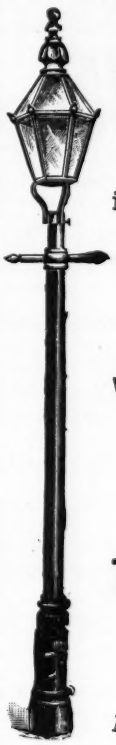

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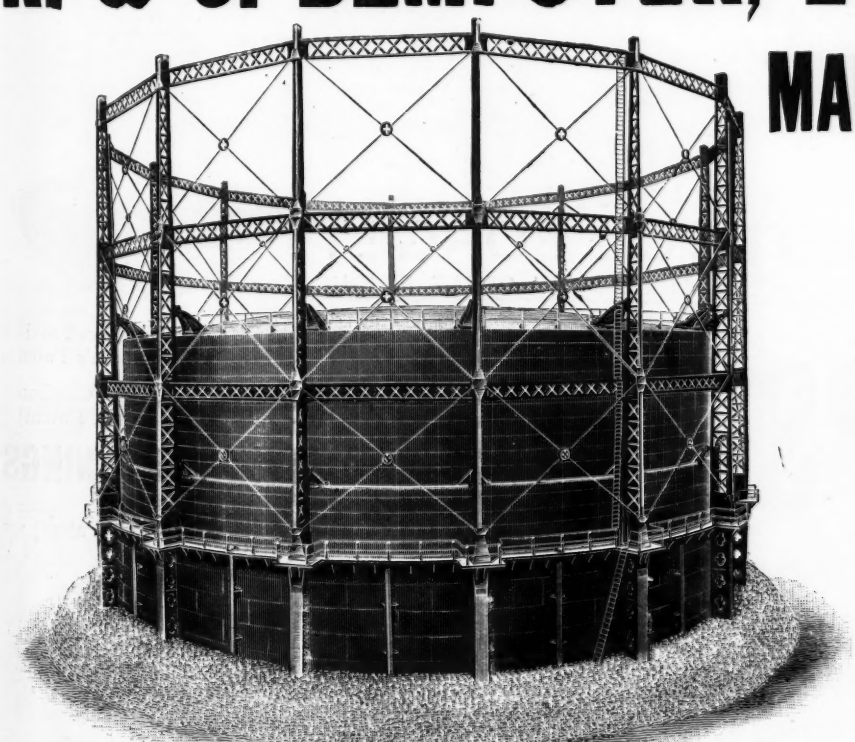

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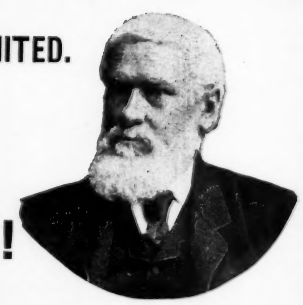

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